JUNE 1992 BYTE TEXT MANAGEMENT • COLOR PRINTERS • WINDOWS SPECIAL REPORT Volume 17, Number 6

BYTE

A McGRAW-HILL PUBLICATION

HP's Vectra with Local Bus
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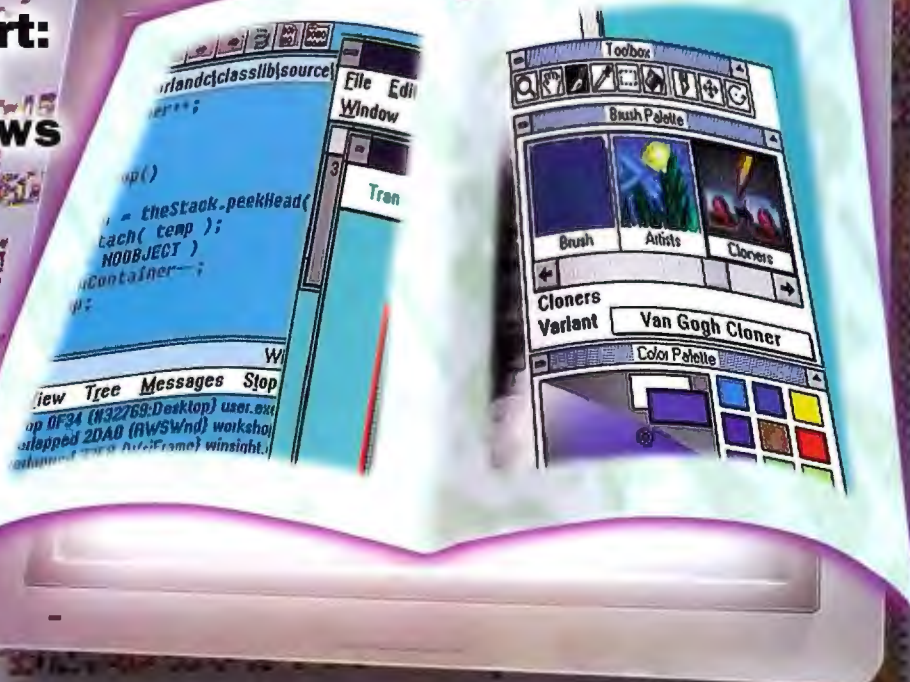
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- 14.4-Oz. Battery Charger, 6.12" x 2.25" x 1.5"
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- Simultaneous Video with 1MB
- 1.44MB 3.5" Diskette Drive
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- Pointing Device
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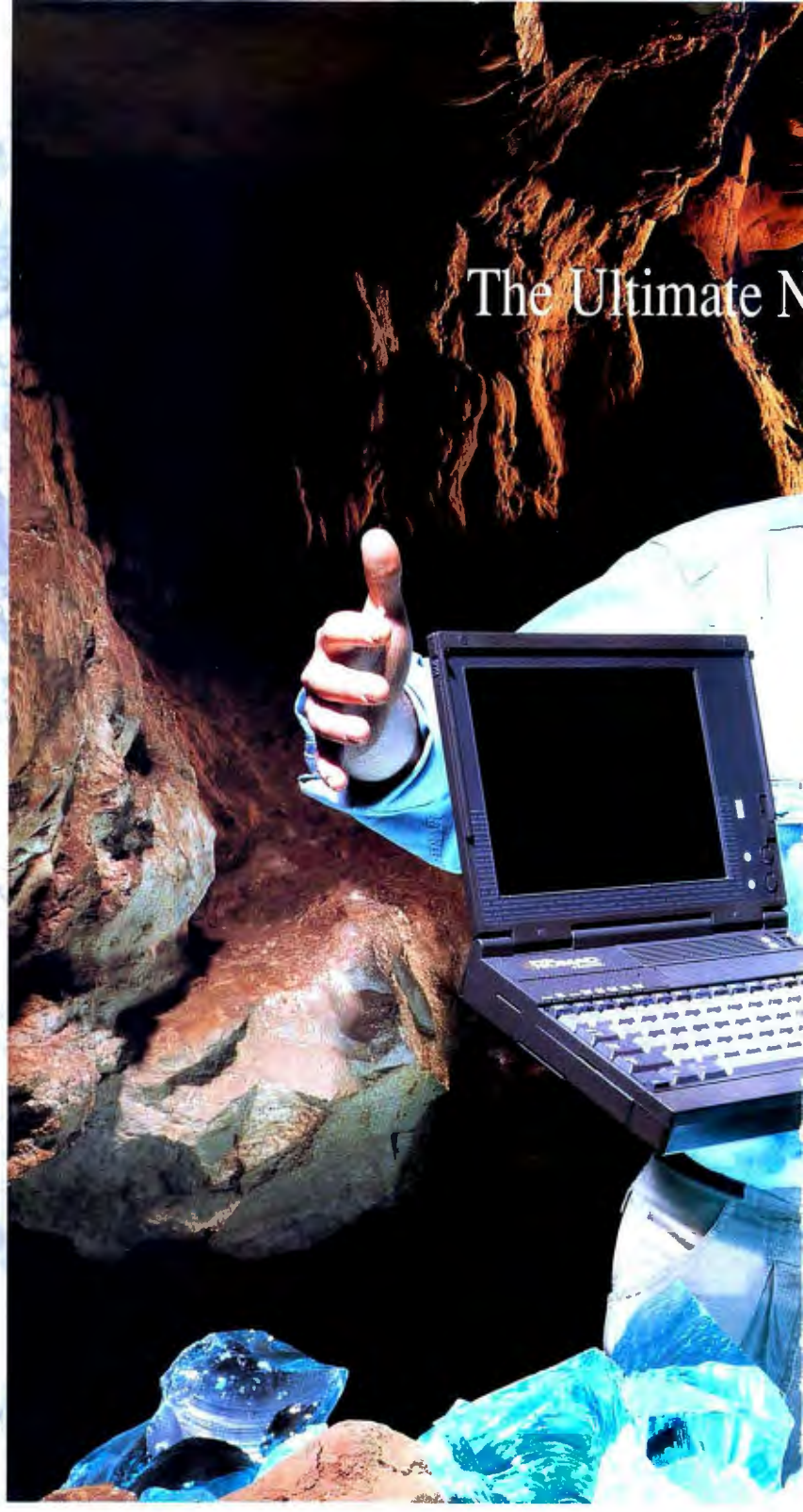
NOMAD 420SXL • $2795
20MHz, Intel® 486SX, 4MB RAM, 80MB Hard Drive

NOMAD 425DXL • $3495
25MHz, Intel 486DX, 4MB RAM, 120MB Hard Drive

Nomad Options: 2,400 bps and 9,600 bps modems, portable printer, numeric keypad, expansion station, Token Ring or Ethernet interfaces, SCSI interface, memory upgrades, executive carrying case, extra batteries

**Battery life was measured using PC Magazine's Battery Rundown Test with power management enabled. Actual results may vary depending on configuration and applications.*

All prices and configurations are subject to change without notice. Prices do not include shipping.



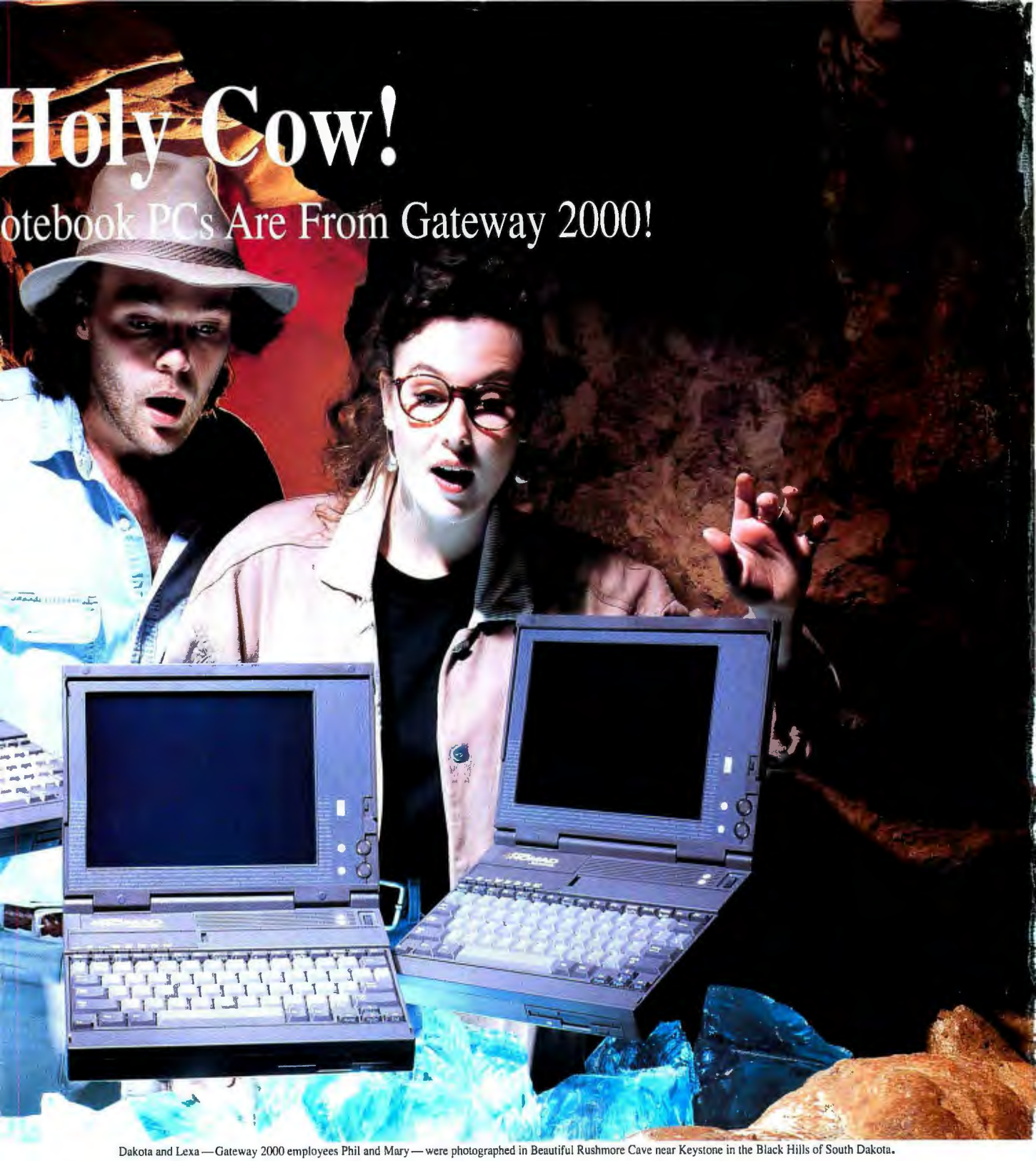
Deep inside a mysterious cave, Dakota and Lexa discover three notebooks called the Nomad Series.

NOMAD They're Dakota's dream come true — notebooks designed for serious computing on the road, all with supernatural battery life, great screens and keyboards, in a compact, lightweight model.

Dakota can't help wondering how these astonishing little machines got here. "They must have been placed in the cave by some ancient civilization advanced beyond our time, or perhaps by beings from another galaxy," he surmises. Lexa, always probing for the truth, points out that the notebooks are clearly marked with the Gateway 2000 logo. Dakota is not satisfied. "Why would Gateway 2000 keep these wonderful notebooks hidden from the world?" he wonders.

"It must be a conspiracy!" Lexa exclaims. "An evil competitor must be behind this! The people at Gateway must have sent us the clues to discover their treasures so we could tell the world!"

"I think you're on to something, Lexa," Dakota agrees.



Dakota and Lexa—Gateway 2000 employees Phil and Mary—were photographed in Beautiful Rushmore Cave near Keystone in the Black Hills of South Dakota.

"Now it's our mission to tell the world about our discovery!"

Dakota pauses. In all the excitement, he has forgotten that Lexa's dream remains unfulfilled.

"I'm sorry, Lexa," Dakota tries to comfort her. "I know you were hoping to find something different — more like a cross between a notebook and a palmtop."

"You're right. These are excellent machines, but they're not quite what I was hoping for," she murmurs.

"But wait!" Dakota shouts, his voice echoing through the cave. "There's another map loaded on my Nomad. Yes, more directions. And the arrow is pointing to something called the HandBook. Do you suppose…?" he wonders.

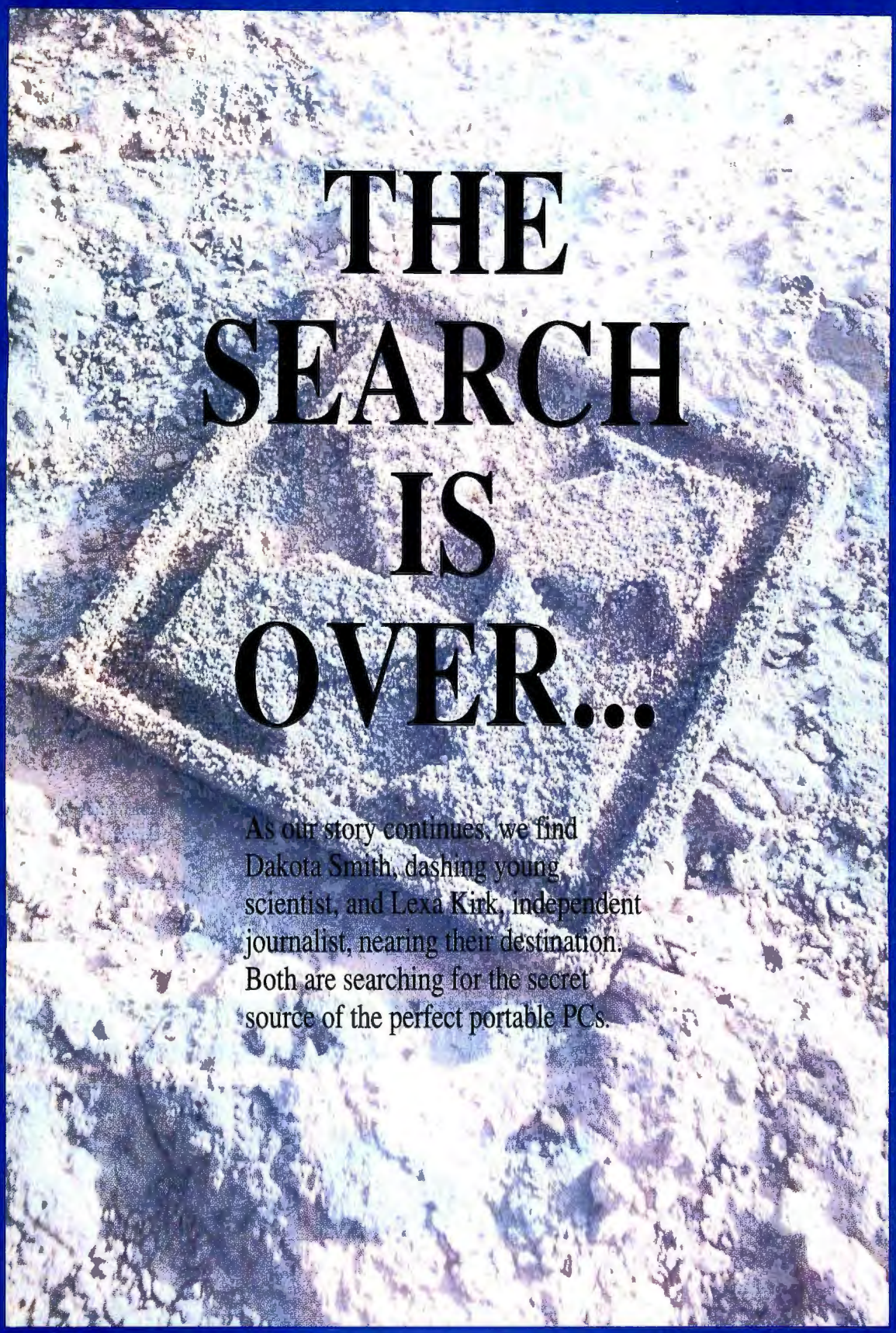
Dakota and Lexa hurry out of the cave. What they thought was their journey's end has turned out to be just the beginning.

TO BE CONTINUED...

GATEWAY2000
"You've got a friend in the business."

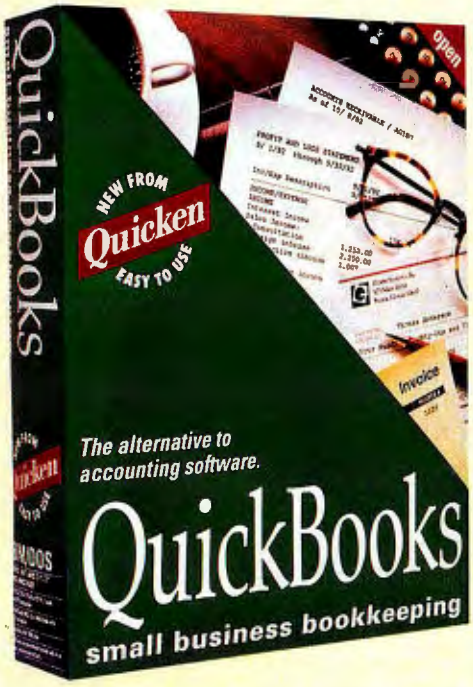
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SouthDakota


THE
SEARCH
IS
OVER...
As our story continues, we find
Dakota Smith, dashing young
scientist, and Lexa Kirk, independent
journalist, nearing their destination.
Both are searching for the secret
source of the perfect portable PCs.

Introducing the alternative to accounting software.

Introducing QuickBooks, from the makers of Quicken. The first software that does your books while you conduct your business. All you do is pay bills, invoice clients, and collect deposits. QuickBooks does all the work to provide you with management information and financial statements – any time you want.



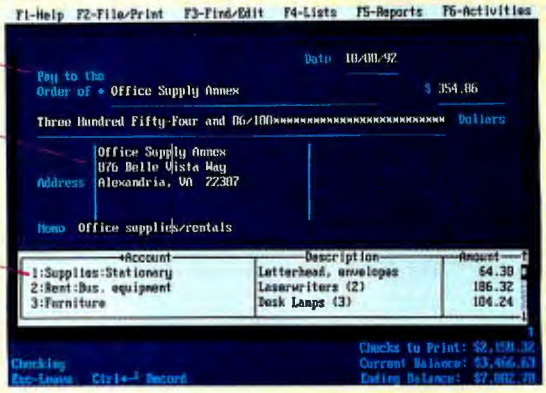
Specifications: PC compatible computer with 640K RAM and DOS 2.1 or higher. Hard disk with 2 MB free.

Stunningly simple to use.

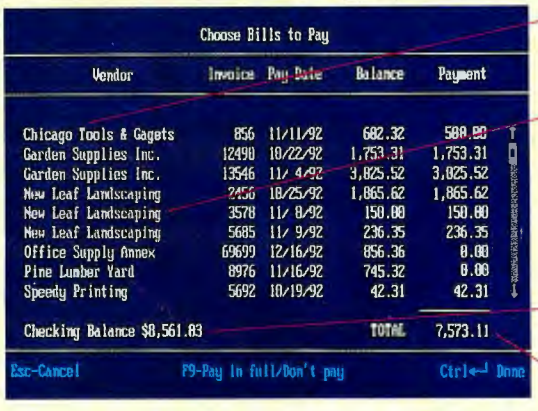
Work with familiar forms.

Only enter information once. QuickBooks remembers your recurring payments.

Flexibly assign expenses.



Choose whom to pay and when.



Just select the bills you want to pay from this list.

Payments to the same vendor can be combined.

Prints checks automatically for all bills selected.

Shows your bank balance.

Totals how much you owe.

Invoice customers in minutes.

Practically no typing.

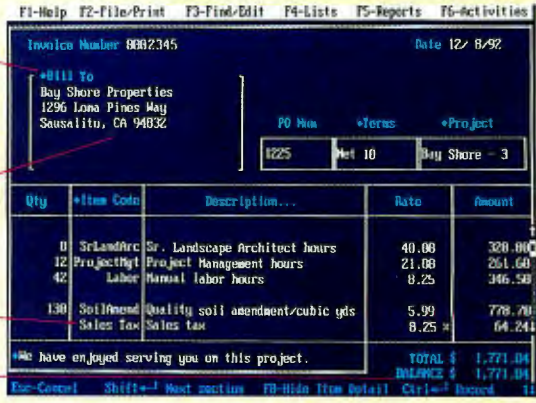
Pick here:



It's entered here.

Sales tax is calculated for you.

The math is done for you.



No accounting mumbo-jumbo.

With accounting software, you had to "post" "debits and credits" and "reverse entries" in "journals" and "ledgers." You practically needed to be a CPA.

But now you can computerize your books without any accounting mumbo-jumbo.

New QuickBooks uses just plain English. If you want to pay a bill, choose "Checkbook" from the Main Menu. If you want to invoice a customer, choose "Invoicing." It's that simple.

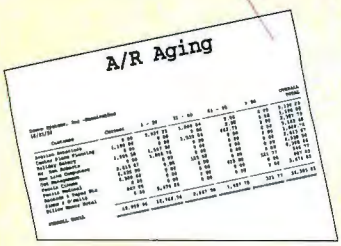


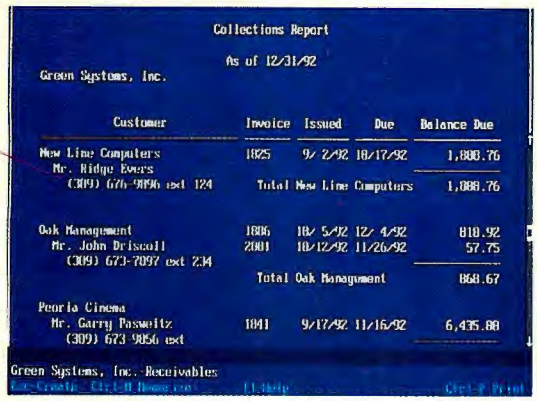
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Collect money faster than ever.

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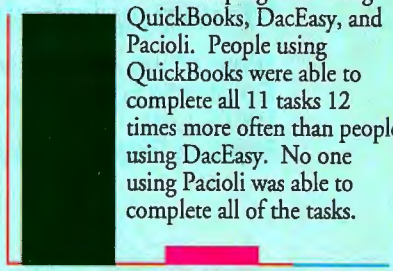
Quickly see who's behind.





QuickBooks proven 12 times easier than leading products.

An independent research firm had small business bookkeepers perform 11 of the most common bookkeeping tasks using QuickBooks, DacEasy, and Pacioli. People using QuickBooks were able to complete all 11 tasks 12 times more often than people using DacEasy. No one using Pacioli was able to complete all of the tasks.



Source: Merrill Research & Associates

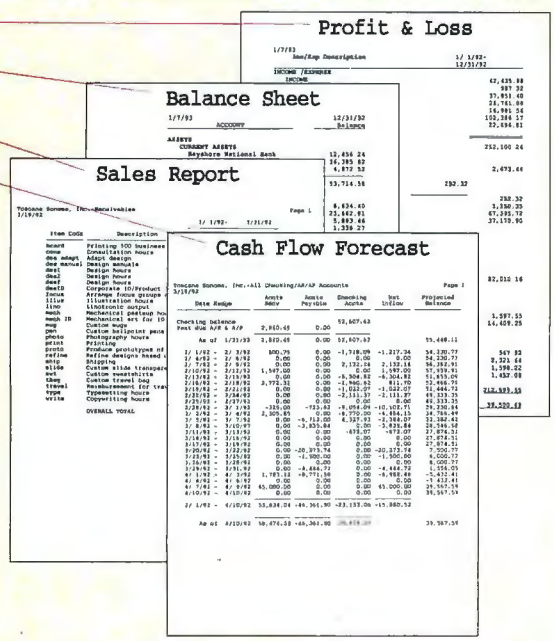
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Get control over your bottom line.

Evaluate your financial resources.

See emerging sales trends.

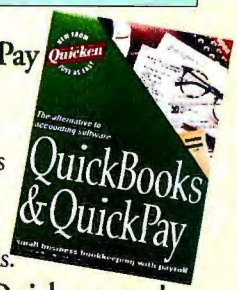
Predict your cash needs.



Complete Financial Reports

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- Collections report
- Accounts payable aging
- Sales tax report
- 1099 report
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- Budget report
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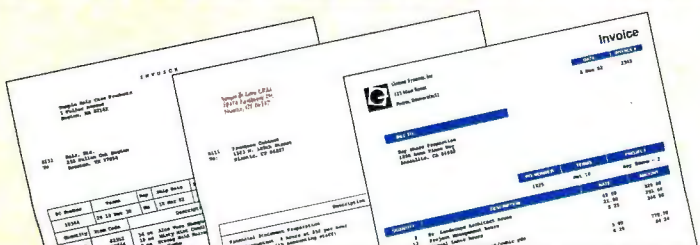
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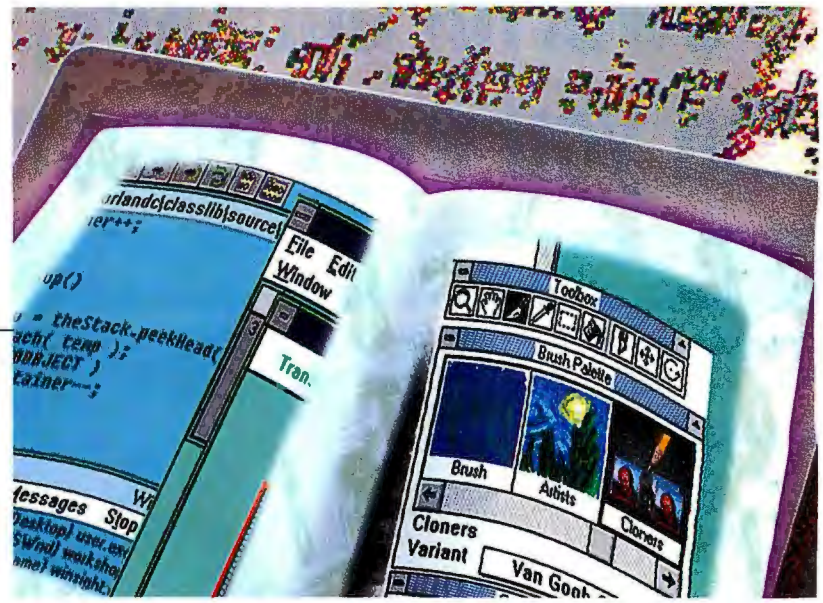
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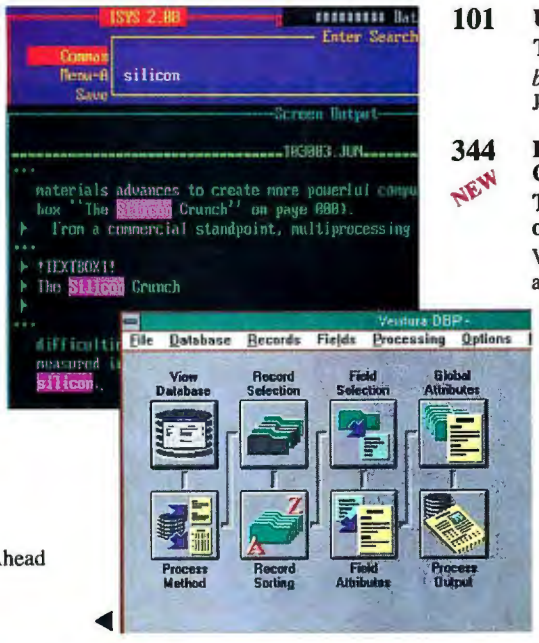
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BYTE (ISSN 0360-5280/92) is published monthly with an additional issue in October by McGraw-Hill, Inc. U.S. subscriber rate $29.95 per year. In Canada and Mexico, $34.95 per year. European surface mail subscriptions $50, airmail $70. Non-European subscriptions, $50 surface mail or $75 airmail. All foreign subscriptions are payable in U.S. funds that can be drawn on a U.S. bank. Single copies $3.50 in the U.S., $4.50 in Canada. Executive, Editorial, Circulation, and Advertising Offices: One Phoenix Mill Lane, Peterborough, NH 03458. Second-class postage paid at Peterborough, NH, and additional mailing offices. Postage paid at Winnipeg, Manitoba. Registration number 9321. Printed in the United States of America. **Postmaster:** Send address changes, USPS Form 3579, and fulfillment questions to BYTE Subscriptions, P.O. Box 552, Hightstown, NJ 08520.

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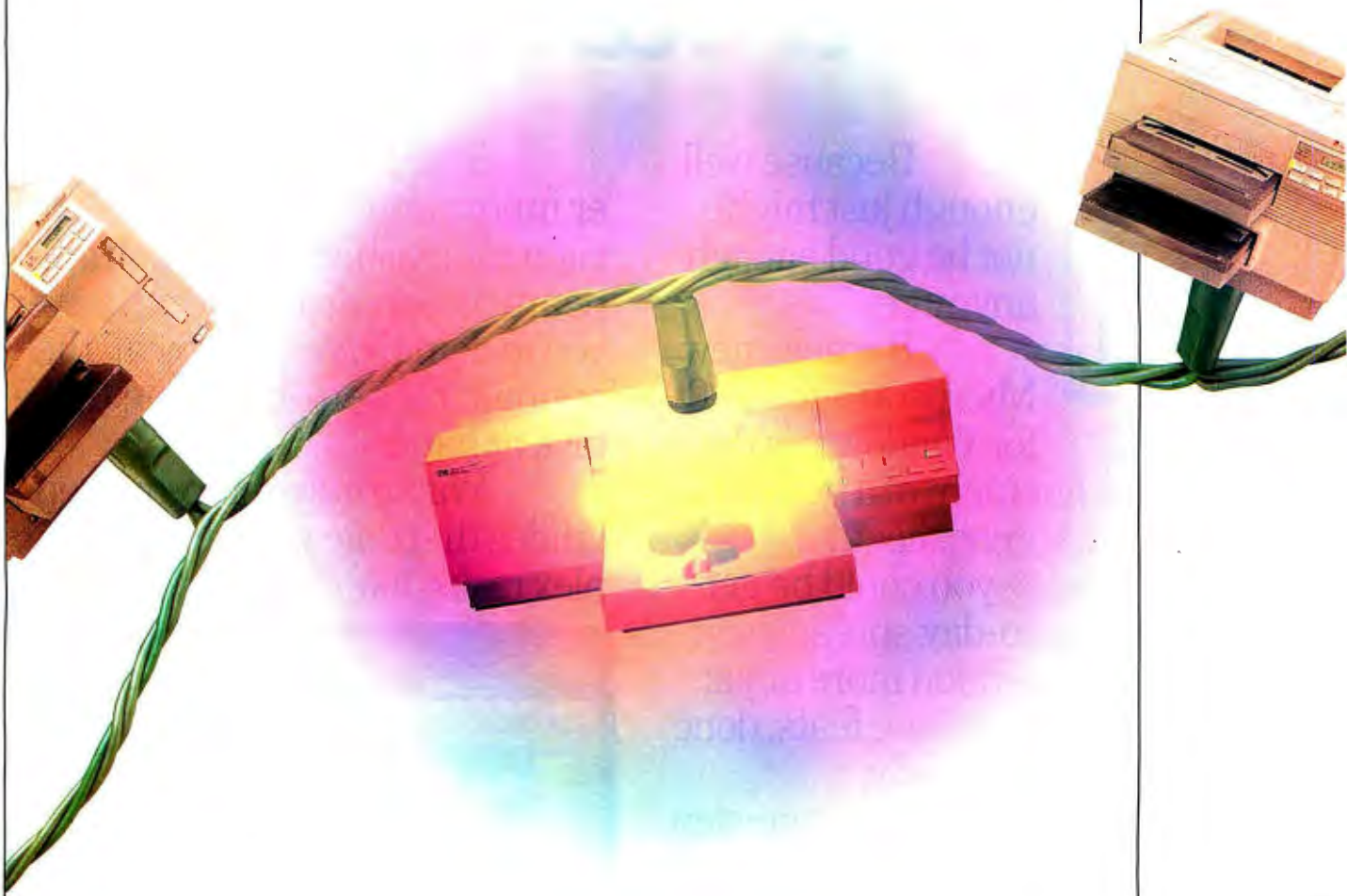
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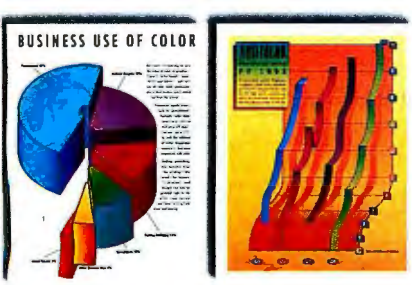
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HP's PaintJet XL300. Now, brilliance doesn't require genius to install.

At last. A 300 dpi color printer that's as easy to add to your system as a LaserJet.



Vivid color has never been so simple. The new PaintJet XL300 inkjet printer gives you laser-quality color graphics, text, and the compatibility of HP LaserJet printers. All for the remarkably low price of just $3,495.*

The PaintJet XL300 has LaserJet compatibility built right in. The same typefaces. The same page formatting. It also has PC/Macintosh auto-switching, so users in a mixed environment can share. And, just like a LaserJet, the PaintJet XL300 becomes network-ready with optional HP JetDirect interface cards.

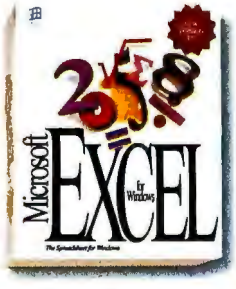
Get laser-quality printing on a choice of media that includes plain paper and transparencies. Or add Adobe® PostScript® for access to even more graphics applications.

See how easily the PaintJet XL300 can bring color to your system. Call **1-800-752-0900, Ext. 3158** for a free print sample and the name of the authorized HP dealer nearest you.

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Microsoft Excel 4.0, the spreadsheet for Windows.

Because well enough just might not be good enough anymore.

Because new Microsoft® Excel 4.0 for Windows™ is the ultimate refinement of a powerful, easy-to-use spreadsheet.

Because you could be getting your day-to-day spreadsheet tasks, not to mention more amazing number-crunching feats, done faster. And more easily.

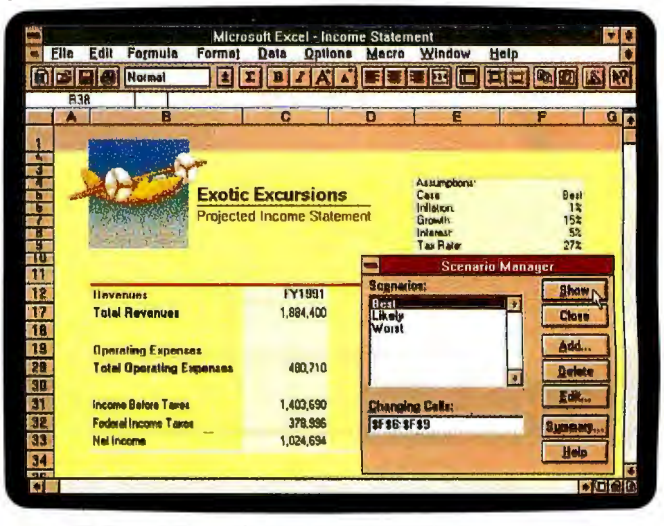
We're talking about one-step just-about-everything here.

Take a feature like Autoformat: with just a click of your mouse, it applies one of 14 sharp-looking, professionally designed formats to your worksheet.

Or consider Autofill, which intelligently helps you build your worksheets. For example, when you type January in a cell, Autofill automatically enters February, March, April—as many (or as few) months ahead as you designate.

Shortcut menus are another innovation. When you click the right mouse button, a menu appears on-screen next to whatever you're doing, offering you all the options that sensibly relate to the task at hand.

Wizards are step-by-step guides that take you through complex tasks, like charting, or creating summary tables from a database, with incredible ease.



The Scenario Manager is a powerful analysis tool that lets you easily create and save multiple "what if" scenarios, then instantly produce nice-looking summary reports. (Which makes you look nice, too.)

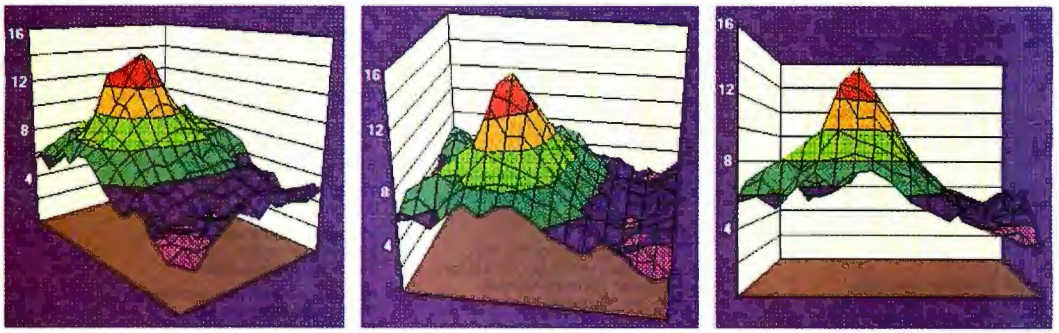
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drop it to wherever you want it on your screen. It's that simple.

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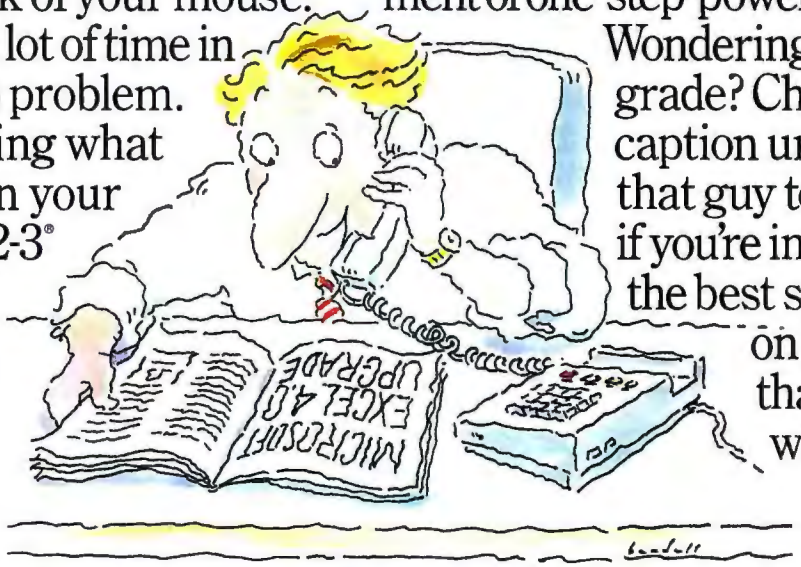


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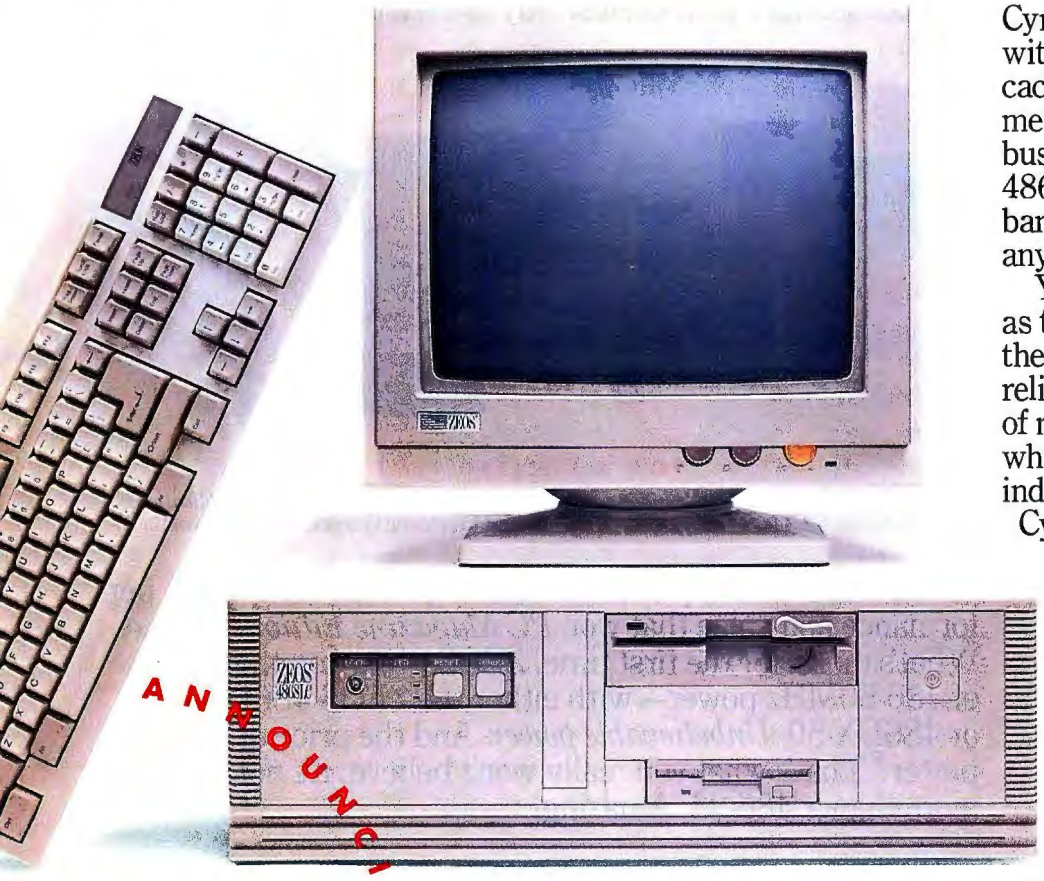
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We tested it against a typical 386SX-20 and a 386DX-33. We tested it again against a 486SX-20. The results? Check out these benchmarks! The ZEOS 486SLC performed nearly

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Announcing New 486SX-25, 48

PC MAGAZINE EDITORS' CHOICE 2-28-92

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86DX2-50 and 486DX-50s!

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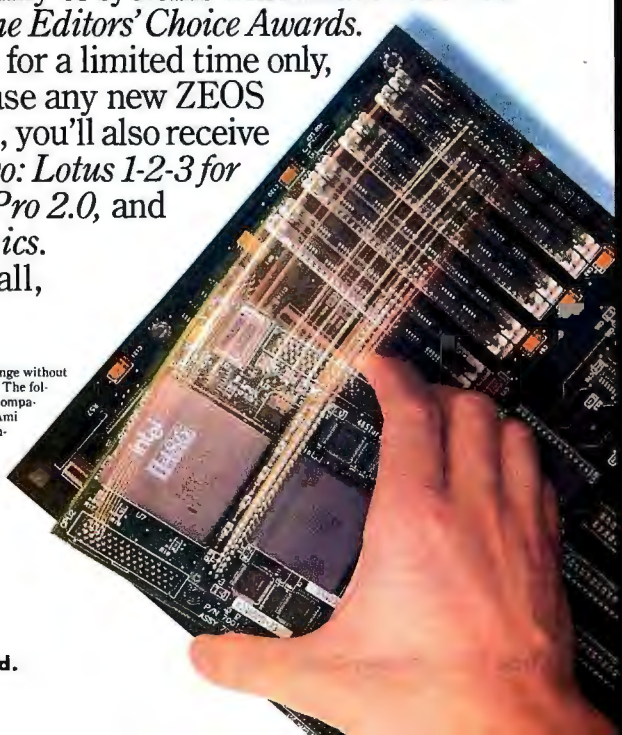
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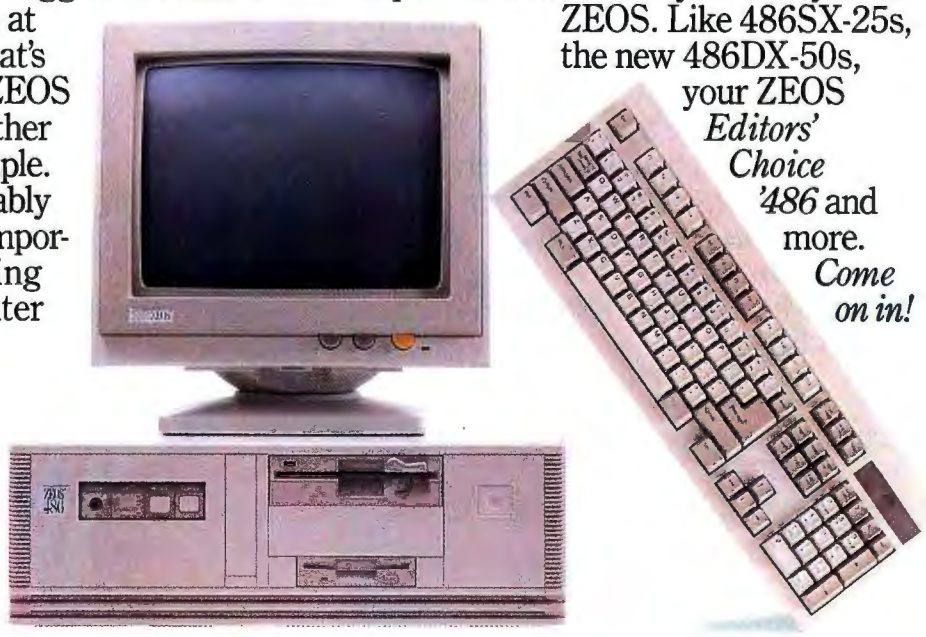
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And all of this is just for starters. Because when you turn the page we're going to talk about other exciting and important reasons for you to buy from ZEOS. Like 486SX-25s, the new 486DX-50s, your ZEOS *Editors' Choice '486* and more. *Come on in!*



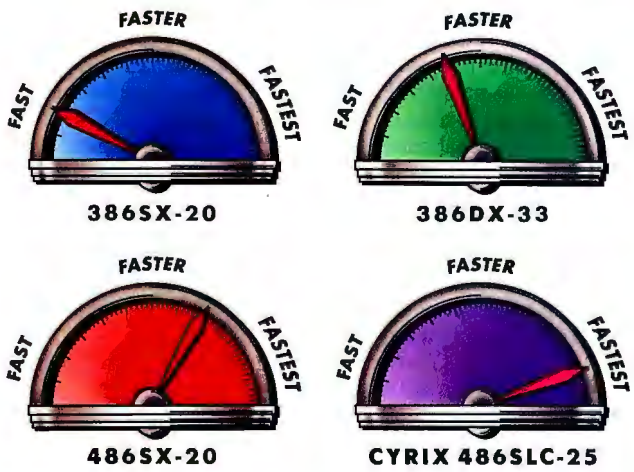
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NOW Pick any two from Lotus!



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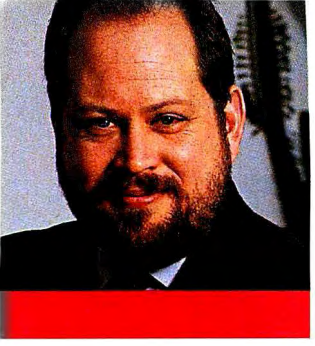
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EDITORIAL

DENNIS ALLEN

MANAGING INFOGLUT

You can't afford not to read this issue of BYTE, because inside is article after article on one of the biggest stories of the decade. No, it's not about a new chip or a new software engine. This story is about the one thing with which we all must deal; this story is about the very fiber of business. As our cover proclaims, these articles cover the strategies and methods for turning textual information into usable knowledge.

To be competitive in business in the 1990s, you must leverage all the knowledge your company can muster

Just think about all the correspondence, memos, reports, proposals, documentation, and news that's been word processed or otherwise placed into electronic form at your company. Those pieces of text contain the stuff that business is made of. Piece by piece, they exist in a delicate mesh of knowledge that permeates your organization. Yet, for the most part, they go unused because the utter vastness of this information has made it seemingly impossible to manage. But this really isn't the case.

There are ways to get a handle on the information, and there are strategies for the future that you can adopt now. The most competitive companies will be the first to adopt search-and-retrieval software and the first to implement strategies for organizing information for the future. They recognize the need to develop their particular company's knowledge base into a repository of information that anyone within the company can access so that the knowledge is neither hoarded nor misplaced.

I recall a story of lost information for NASA's space shuttle. Several years back, when it became apparent that the space shuttle would need extra heat protection for reentry, the obvious answer was to attach special tiles to the underbelly of the craft. It was obvious because there had been extensive research on the tiles years earlier. But the research data was, at least for a while, lost.

It was not a matter of simply calling an old employee and asking where the files had been placed; many people had been involved in acquiring the information, and they simply couldn't be reached. NASA—with all its computing power—was left in a quandary of not knowing where the information was located and not having the funds to develop the tile information anew.

Your company can easily find itself in a similar situation; maybe it already has. Consider projects that have been halted for one reason or another. What happened to all the information—the research, reports, and supporting documents—that was accumulated before the project was dismantled? Perhaps it went into the archives, someone's desk drawer, or the shredder.

Or what about that key employee—what happens when he or she leaves the company? They may leave their disk files intact, but unless you know what's in them, or unless the information happens to have been well organized, those files are useless. Imagine when employees leave how many hard disks have been reformatted to reclaim disk space for the next employee while throwing away information that may have taken years to amass.

My bet is that you'll need that information someday, but you may not know that you ever had it. Even if you have the information, not knowing how or where to find it is hardly different from not having the information at all. That's why this issue is a *must* read. To be competitive in the 1990s, you have to leverage all the knowledge your company can muster. My advice is simple: Don't waste a second in exploring ways to manage the vast textual information hidden away in your company.

That's why the BYTE staff has pulled together such a strong collection of articles on the subject. From the strategies of organizing information and turning text into usable knowledge to the tactics of search-and-retrieval software and WYSIWYG word processing, it's all here in this issue.

Of course, doing the bigger story had its own challenges—chiefly, how to convey the concept on the cover of the magazine. Frankly, it would have been easier to put a photo of the newest and fastest PC hardware on the cover. To do so, however, would have been to duck what is one of the most important issues in computing today. Yet, you may not see the subject make the cover of other publications.

This is the first time that an in-depth, multi-article report on the subject of turning text into knowledge has been published in the popular press, and it seems only appropriate that it appear on the cover and in the pages of BYTE.



—Dennis Allen
Editor in Chief
(BIX name "dallen")

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Raphael Needleman, *InfoWorld*, January 27, 1992

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LETTERS



Now We Know...

In case you were wondering, yes, I *did* notice the hidden letters on your February 1992 cover.

M. Brasse
Schinnen, The Netherlands

It's true, the "hidden" letters in the circuit traces spell I-B-M. Did anyone feel an overwhelming urge to buy a PS/2?—Eds.

Internet Excellence

As one of the millions of Internet users, I was very pleased to discover another article on the single most important advance in communications history since people began speaking ("Applying the Internet," February). I hope that BYTE will obtain without delay an Internet address for those of us who can't afford BIX and don't wish to use snail-mail or fax. You might also want to offer a monthly Internet column as a way of popularizing the Net and encouraging network citizenship.

David Mattison
Victoria, BC, Canada

Ask and you shall receive. BYTE's editors already have Internet addresses. Now we have an Internet address for letters as well. Send your comments to letters@bytepb.byte.com.—Eds.

Multimedia Isn't Cutting It

I've read lots of solemn discussions lately about multimedia, and how it will be used for training, business presentations, and so on. These guys must be kidding! The main uses of multimedia will be pop videos, games, and X-rated movies. That's where the money is.

If you accept this, then it's obvious that the Philips-Sony approach of making the multimedia player as simple to use as possible is correct, and the IBM-Microsoft idea of extending the PC to do the job is a loser. Things like training and business presentations will be small-time spin-offs from the main business.

Michael J. White
Wahroonga, Australia

Gallium Arsenide Issue

I was surprised to read in "Gallium Grows Up" (February, page 143) that the electron mobility of GaAs increases with temperature. All the references that I have show that above 100 K the opposite is true, as μ_n reduces at a rate between $1/T$ and $1/T^2$ depending on the actual material and measurement technique. This does not affect the general conclusion of the article: that GaAs will be incorporated into commercial systems only when its higher manufacturing costs are outweighed by its performance advantages over silicon.

Besides brittleness, another reason for higher manufacturing costs is the demands of the associated processing methods and tolerances. These are brought about by the nature of the currently dominant GaAs device, the MESFET (metal semiconductor field effect transistor), which is not as well suited to logic applications as the silicon MOSFET (metal-oxide semiconductor field effect transistor). In particular, to keep the number of devices at a minimum (fewer devices mean higher yields), it's necessary to use enhancement-mode MESFETs, which require very accurate control of the thickness of the device's active region. Processing difficulties like these have as much to do with determining the commercial viability of a semiconductor device as the theoretical benefits of the device itself.

Mark Bowser
Essex, U.K.

Great Interruptions

I just finished reading Roger Alford's "How Interrupts Work" (February) and thoroughly enjoyed the content of the article. It was well written, and it clarified the workings of IRQs in the IBM PC and AT.

Jeffrey S. Glenn
Concord, NH

Way Late Mail

Enclosed is something you might find amusing. In 1977, a BYTE reader circled a "bingo" number from the December 1977 issue. In February 1978, we mailed product information in response. Just 14 years later, on January 28, 1992, we received the enclosed envelope back marked "No Forward Order on File."

Incidentally, the product information inside was for the "AD8" S-100 computer-controlled music synthesizer. Carl Helmers, then editor of BYTE, was one of the first customers to buy this product.

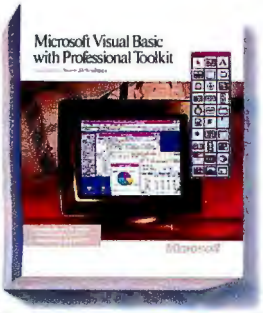
Philip Tubb
ALF Products, Inc.
Wheat Ridge, CO

From the markings on the envelope, it appears that ALF's mailing spent 14 years in the USPS Dead Letter Office in St. Paul, Minnesota.—Eds.

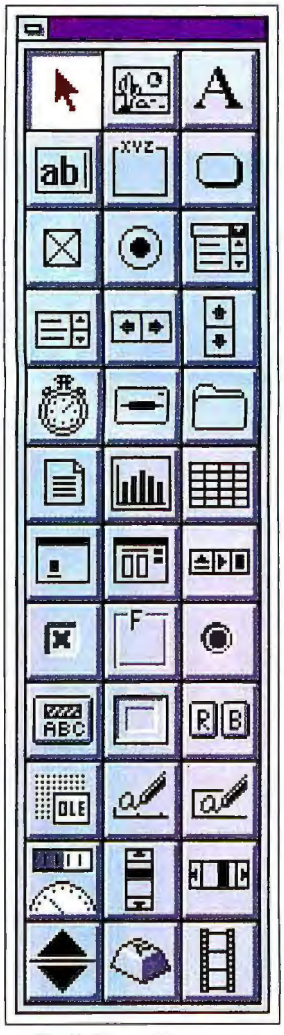
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FIX

The correct price for Cayman Systems' XGator 1.0 (Reviewer's Notebook, February) is $295. ■



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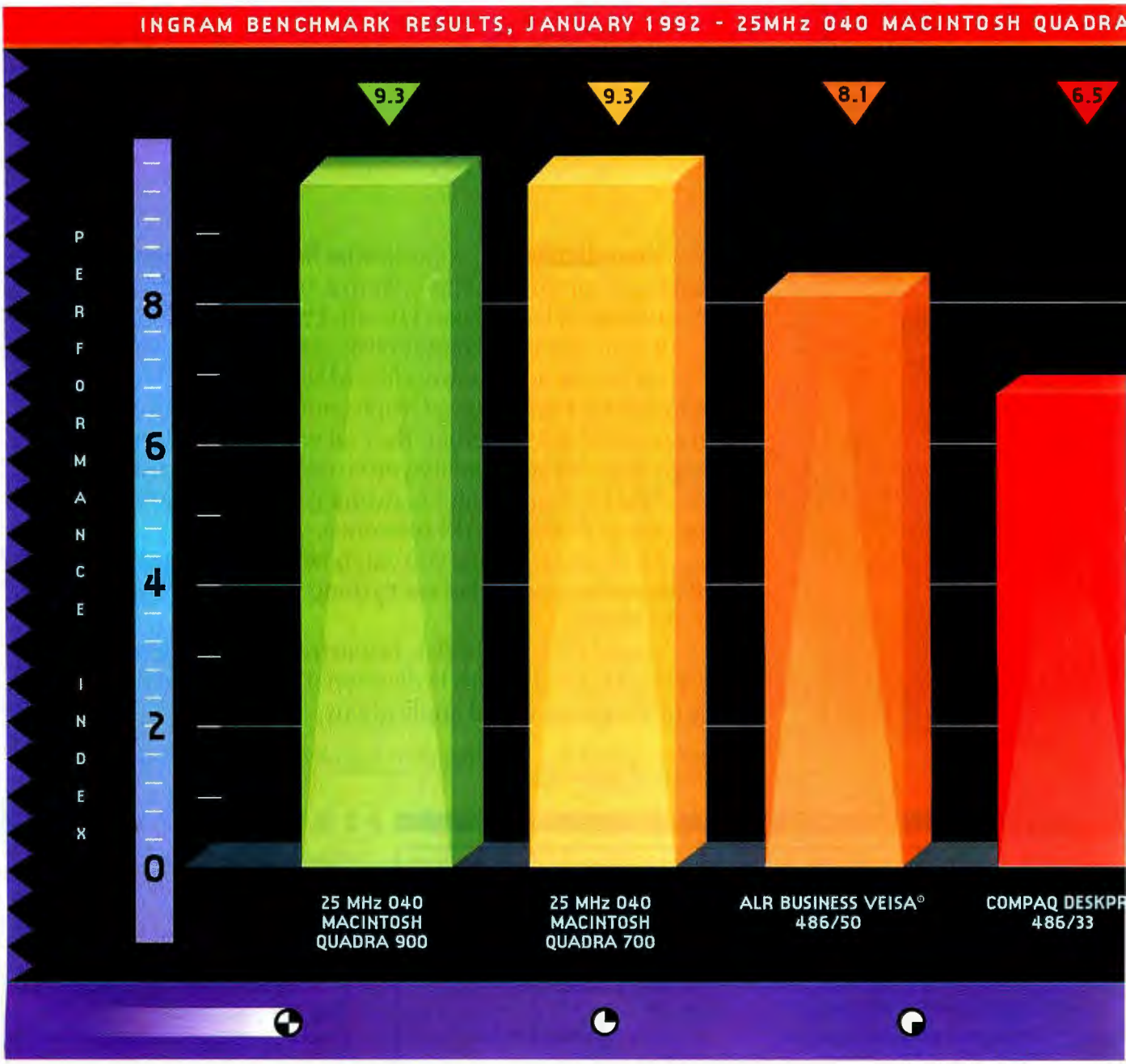
PROGRAMMER'S TIPS

- *Take advantage of the Common Dialog control to instantly create File Open, File Close, Color, and other standard dialog boxes.*
- *Use the MDI Child control with a "Window" menu option where 'Tile', 'Cascade', and 'Arrange Icons' options are included for the MDI child windows.*

Microsoft

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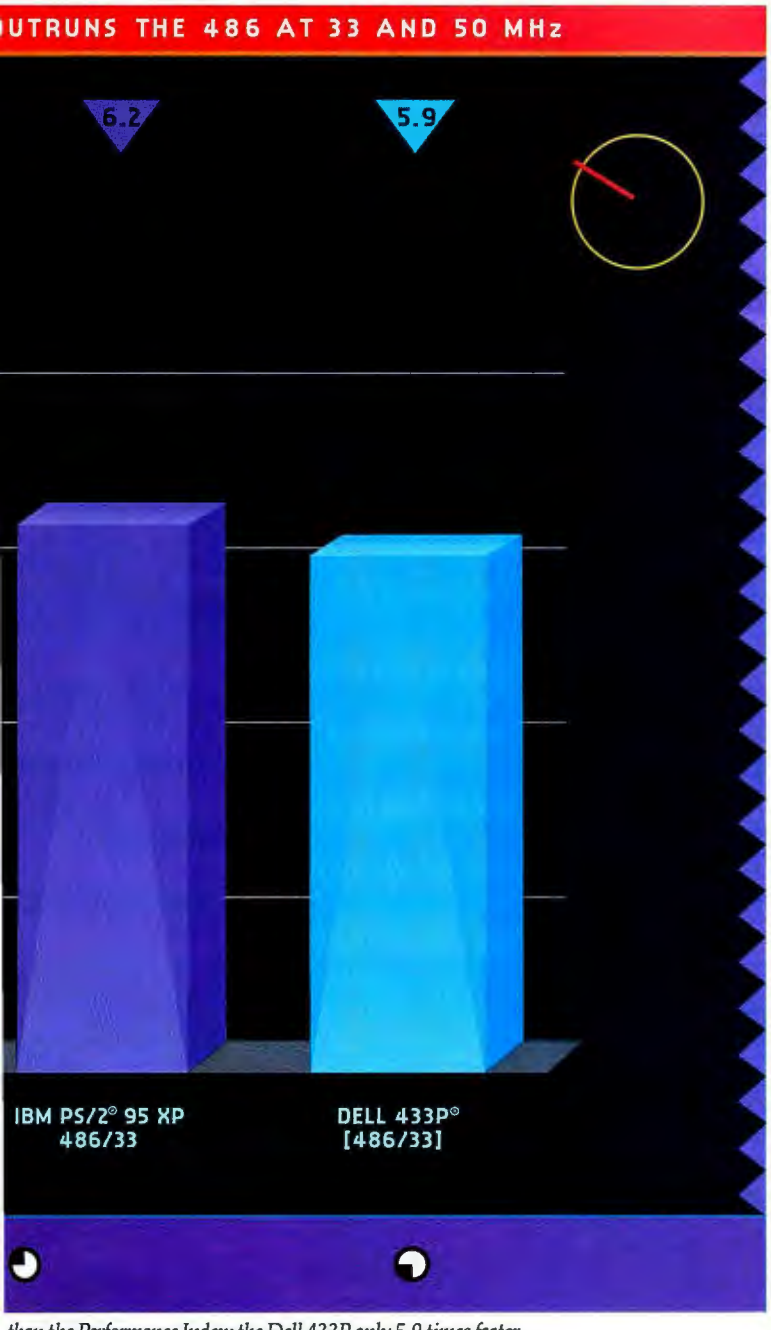
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*Performance Index is the measured result relative to the slowest machine tested (a 286-based IBM PS/1 running Windows). For example, the Macintosh Quadra is 9.3 times

[1]Ingram Performance Report by Ingram Laboratories, published 10/91, revised 1/92. [2]Software programs used in benchmark test were Microsoft® Word,® Excel,® PowerPoint,® Wingz,® PageMaker,® Persuasion™ and Illustrator.™ Motorola and the Ⓜ are registered trademarks of Motorola, Inc. Apple and Macintosh are registered trademarks, Macintosh Quadra is a trademark of Apple Computer, Inc. All other brand or product names indicated by ® or TM are regist

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NEWS

MICROBYTES

Nutek: A Mac Emulator in Progress

Early last year, Nutek Computers (Cupertino, CA) announced that it had developed a Mac-compatible operating system and a set of chips that let system vendors make Mac clones without infringing on Apple's patents or copyrights. After the announcement, Nutek continued to quietly plug away at its Mac equivalent, shunning the glare of publicity. However, the company recently reappeared at the CeBIT show in Hannover, Germany, with a logic board complete with a 68030 processor. BYTE staff subsequently spent several hours with Nutek representatives at their U.S. offices and discovered that the Nutek system is still a work in progress, but it's real. Nutek hasn't decided if it will sell the board to system manufacturers or through dealer/distributor channels.

Nutek shuns the term *clone* for its computer because the word suggests the idea of a copy. The hardware isn't a precise duplicate of the Mac, and the software was written independently, not copied. The main logic board—the actual hardware that Nutek will sell—resembles that of a Mac IIci. The board has a 33-MHz 68030 CPU, three NuBus slots, two miniature DIN-8 serial ports, and DB-25 and internal 50-pin ribbon SCSI connectors that are managed by two 53C80 SCSI controller chips. Sound input and stereo-sound output ports handle sample rates of 22 and 44 kHz. The system also offers built-in video using a DB-15 (Apple standard) connector and two connectors for floppy drives. The keyboard and mouse, however, use PS/2 connectors.

Prototypes have a standard PC chassis, a 40-MB SCSI drive, and a Fujitsu floppy drive that writes 800-KB GCR (Group Code Recording)–encoded floppy disks and has software-controlled disk ejection. Shipping units will use PC-standard 1.44-MB floppy drives with MFM encoding.

Three on-board custom ASICs (application-specific ICs) serve as the glue between Nutek's Mac OS/firmware emulation and the mixture of Mac and PC hardware. Nutek chip 1 handles all I/O and the real-time clock. Nutek chips 2 and 3 manage memory control and the NuBus interface. DMA channels are used with the SCSI, floppy drive, and sound subsystems. An EEPROM chip holds boot code that loads Nutek's clean-room implementation of the Mac Toolbox and operating system from a floppy or hard disk into main memory. The reason for loading the firmware this way—a method that's similar to what early Amigas did with their KickStart code—is twofold: It's easier to patch the firmware and provide updates to users in the field, and the code executes faster in RAM. This firmware is a comprehensive implementation of System 6.0.x software managers and a subset of System 7.0 features.

Firing up the Nutek emulator, you see a slightly different interface. Unix wizards will recognize it at once—Motif. However, this appearance is only screen-deep: Motif supplies only the GUI; the rest is Nutek's Mac OS emulation. Motif adds its own twists to the interface. The menus behave differently, and the menu bar appears inside the active window. For Mac Command-key equivalents on the 101-key standard PC keyboard, you hold down the Alt key and press the appropriate second or third keys. Nutek substitutes its own bit-mapped fonts for the standard Apple System fonts of Geneva, Monaco, and Chicago.

Nutek's board is meant to support the major mainstream applications. The company's target is the less sophisticated user who runs only several major applications (e.g., a word processor and a page-layout application).

The system was run using two Claris applications, MacWrite and ClarisWorks. They worked without apparent problems, as did a copy of PageMaker 3.0 from Aldus. But the system had trouble with PageMaker 4.2 and with a PageMaker document with a color TIFF file and several EPS (Encapsulated PostScript) files embedded in text. The TIFF file reproduced correctly, but the placement bit maps for the EPS files were garbled, apparently due to a scaling problem.

continued

NANOBYTES

USRobotics (Skokie, IL) has developed a modem for the **Hewlett-Packard 95LX**. The $249 WorldPort Fax Data Palmtop Modem's communications software is built into the modem and runs on a 9-V battery. An AC adapter is included. □



Exactly two years after it first announced the project, Quarterdeck Office Systems (Santa Monica, CA) released **Desqview/X**, its 32-bit operating system that lets 386SX or higher PCs run graphical X Window System programs residing on a Unix host. Desqview/X also lets the same Unix hosts or X terminals run DOS or Windows programs residing on the PC. "Getting Microsoft Windows to run remotely on a Sun workstation was the final step," said Therese Myers, Quarterdeck's president. □

Sun Microsystems has spun off another company, **SunSelect**, that will focus on products to bridge the PC and Unix environment. The new company, to be headquartered in Billerica, Massachusetts, will assume responsibility for Sun products that will integrate PCs and PC LANs with Unix. □

Apple is developing A/UX 3.0 Secure, a **C2-level** certifiable version of its Unix variant. It expects the operating system to be available in the fourth quarter of this year. □

A 1991 trip to Latvia by U.S. business executives has resulted in the formation of **Basec** (Boston, MA), a company that has developed a program that aggregates data in Excel 3.0 for Windows. Versions for other spreadsheets are planned. □

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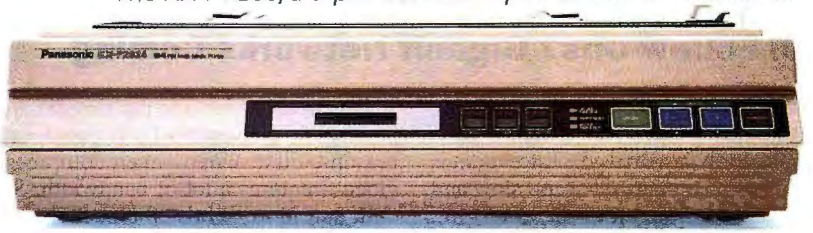
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The Mac low-level benchmarks showed interesting results: The floating-point tests, using SANE (Standard Apple Numeric Environment), ran fine, but the video tests did not. From the looks of the erratic screen updates in PageMaker, there's still work to be done on the Window Manager. Nutek is also talking to SuperMac and RasterOps to help provide support for their display systems.

Nutek has gone to great lengths to document its clean-room design of the Mac firmware. There are no ex-Apple employees, and the work is archived into a third-party vault for future reference. The company has also allocated funds to handle a potential lawsuit. Patented technologies, such as the ADB (Apple Desktop Bus) mouse/keyboard and AppleTalk protocols, are not present in Nutek's design. There's no doubt that Nutek is pulling off an admirable feat in emulating a Mac. Whether the company can get the implementation thoroughly debugged and persuade people to buy it is an unanswered question.

—Tom Thompson

Industry Veterans Found Research Company

Paul Allen, the president of Asymetrix, and David Liddle, the founder of Metaphor, have founded a new company, called Interval Research (Palo Alto, CA), with the goal of performing research and advanced development in areas of new technology. The company probably won't produce any products; instead, it will either license technology to other companies or spin off new companies to further develop and market technologies that it has created. Allen described the latter technique as a way of allowing researchers to profit directly from a new discovery or invention.

Interval Research will focus its efforts on information systems, communications, and computer science. Allen said that some of the initial areas of research would include "domain-specific software design, applications for new data services, ubiquitous computing, new human interaction models, and generic encoding of on-line knowledge." He was not specific about the details of these areas of research, but he did say that the research would go beyond what people see today and would involve dealing with the difficult problems of computing across different platforms and operating systems.

—Owen Linderholm

News from Apple: How VITAL for Independent Software Vendors?

In the coming months, Apple plans to release products based on VITAL (Virtually Integrated Technical Architecture Lifecycle), a conceptual framework for integrating the Mac into enterprise computing systems. At the March DB/Expo in San Francisco, the company released a series of five documents describing the framework, the first of which presents a set of architectural principles, models, and guidelines. Products will follow over the coming months, Apple said.

Underlying all the talk of open systems and vendor-independent interoperability, Apple is promoting its own set of APIs to database and network services. Collectively called the Integration Services Manager API, Apple's interfaces provide access to relational databases (Data Access Manager), network protocols (Communications Toolbox), message services (Open Collaborative Environment), and on-line transaction services (Transaction Submittal Services). Unlike similar efforts from Microsoft and Borland, Apple is pitching its API plans not to independent software vendors but to corporate MIS departments.

—Ellen Ullman

FDDI Follow-Ons? Gigabit Networks Coming

FDDI (Fiber Distributed Data Interface), the 100-Mbps successor to today's networks, has only just arrived. However, it is already being stigmatized as too slow and poorly suited to meeting the emerging needs of network customers, especially in regard to multimedia.

In general, video and multimedia are a problem for conventional networks for two reasons. First, video—even compressed video—requires a lot of bandwidth. Second, and more subtly, the packet-based nature of most network protocols is a poor match for video. In general, packets of

NANOBYTES

Having announced its intention to acquire Fox Software (Perrysburg, OH), Microsoft (Redmond, WA) is placing itself in head-to-head competition with Borland International for control of the personal computer database market.



Fox's database development group will move to Microsoft's headquarters in Redmond, and Fox president and cofounder **David Fulton** will become a database architect. Fulton declared himself "delighted about all of it," and he showed no apparent regret about the forthcoming change in his status from company president to technical manager. Referring to Microsoft's vast resources, Fulton said, "I feel like a kid with the biggest electric train in the world." □

As part of the Microsoft/Fox announcement, Bill Gates, chairman and CEO of Microsoft, revealed details about his company's rumored **Cirrus** desktop database product. Gates said that Cirrus is a graphical browsing and management tool, based on Visual Basic, that lets developers and users access enterprise-wide data sources. Both Cirrus and FoxPro will use the Open Database Connectivity programming interface as front ends to a wide variety of data sources, including SQL (Structured Query Language) databases. Cirrus should soon be entering the beta-test stage. □

A 24-hour digital assistant that never takes a coffee break? That's how Xerox (Palo Alto, CA) describes **PaperWorks**, a Windows-based program that lets you remotely retrieve, store, and distribute documents using any fax machine. With special forms that you fax to a PC or fax server, you can send out documents to any other fax machine. Boxed fields in the forms let you indicate recipients' fax numbers. □

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Novell's *Network C for NLM's SDK* includes C/386

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Autodesk, *Robert Wenig, Manager, AutoCAD for Windows:* "At Autodesk, we're using WATCOM C/386 in the development of strategic new products since it gives us a competitive edge through early access to new technologies. We also highly recommend WATCOM C/386 to third party AutoCAD add-on (ADS and ADI) developers."

Fox Software, *David Fulton, President:* "FoxPro 2.0 itself is written in WATCOM C, and takes advantage of its many superior features. Optimizing for either speed or compactness is not uncommon, but to accomplish both was quite remarkable."

GO, *Robert Carr, Vice President of Software:* "After looking at the 32-bit Intel 80x86 tools available in the industry, WATCOM C was the best choice. Key factors in our decision were performance, functionality, reliability and technical support."

IBM, *John Soyring, Director of OS/2 Software Developer Programs:* "IBM and WATCOM are working together closely to integrate these compilers with the OS/2 2.0 Programmer's Workbench."

Lotus, *David Reed, Chief Scientist and Vice President, Pen-Based Applications:* "In new product development we're working with WATCOM C because of superior code optimization, responsive support, and timely delivery of technologies important to us like p-code and support for GO Corp's. PenPoint."

Novell, *Nancy Woodward, V.P. and G.M., Development Products:* "We searched the industry for the best 386 C compiler technology to incorporate with our developer toolkits. Our choice was WATCOM."

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computer data must all arrive, although they don't have to be in order. Video and voice can withstand the loss of information to a certain degree, but they don't handle out-of-order data well.

Backers of FDDI are already talking about FFOL (the FDDI Follow-On LAN), which has speeds of at least 600 Mbps and possibly 1 Gbps. The need for high-speed WANs (wide-area networks) has fueled other activity. IBM is getting ready to conduct field trials of a 1-Gbps WAN called PLANET (Packetized Lightwave Architecture Network) at its Thomas J. Watson Research Center (Yorktown Heights, NY). And IBM's 1-Gbps LAN, Metaring, is scheduled to start tests this summer. In addition, ANSI has established a subcommittee of X3T9.5 to establish FDDI II to handle higher throughputs.

Like FDDI, all the candidates are optical-fiber networks; however, they use the fiber bandwidth differently. Most of them are broadband networks that carry multiple channels on the same fiber. Metaring uses single-channel fiber. PLANET features real-time packet delivery to prevent jerky video. FDDI II is a hybrid that combines a packet-based protocol for data and a virtual circuit for video and voice.

None of these networks is going to happen soon. Developers say that the networks are years away from general availability.

—Rick Cook

Lotus and Novell Strengthen Ties with Notes NLM for NetWare

In a deal that represents the most substantial collaboration since their failed merger two years ago, Lotus Development and Novell are integrating Lotus's Notes group communications package into the NetWare environment. Lotus will develop a version of its client/server Notes package that will run natively on NetWare servers and support Novell's MHS (Message Handle Services) messaging protocol. The companies will also cooperate on marketing efforts, including joint training on Notes for Novell's pool of VARs (value-added resellers).

Notes executes only on OS/2 1.x servers and OS/2 PM (Presentation Manager) or Windows clients. Thus, customers who want to use Notes in the NetWare environment must run it on a separate OS/2-based server that communicates with NetWare via an OS/2 requester. By rewriting Notes as an NLM (NetWare loadable module) for the 32-bit NetWare 386, Lotus will let customers run the server component of the package without an OS/2 machine.

Lotus will make the move to NetWare in several stages. First, Notes 3.0 (as well as the next version of cc:Mail), both expected before the end of this year, will add support for Novell's NetWare IPX/SPX transport protocols. (Lotus has said that it will add support for Mac clients in the same release.) In a separate development, Lotus will deliver Unix client and server versions of Notes in early 1993.

Late in the first half of 1993, Lotus plans to ship the Notes NLM, which will also fully support MHS and NetWare Global Messaging, as alternatives to the Notes messaging engines. Users will be able to use multiple mail transports concurrently, Lotus says. And by supporting MHS, Notes will be able to connect with any back-end mail system that NetWare supports.

In roughly the same time frame, Lotus and Novell will be moving to use the emerging VIM (Vendor-Independent Messaging) standard, of which they are key proponents and developers. Both companies also say that they are migrating toward the use of X.500 global-directory services in their mail and messaging products. The Notes NLM will require NetWare 3.2, which is scheduled to ship in the fourth quarter of this year.

—Andy Reinhardt

MiniStor Unveils Tiny Notebook Drives

A San Jose–based start-up company has unveiled a new family of hard drives that continues the trend of shrinking rotating magnetic media. This could pose a challenge to the acceptance of more expensive solid-state storage cards.

MiniStor Peripherals' Portables series of subminiature drives uses 1⅛-inch platters instead of the 2½-inch platters now common in notebook drives. The drives, which are now shipping in evaluation quantities, will be available in various sizes and thicknesses. The slimmest model, a removable drive with a 32-MB capacity, can fit into a

NANOBYTES

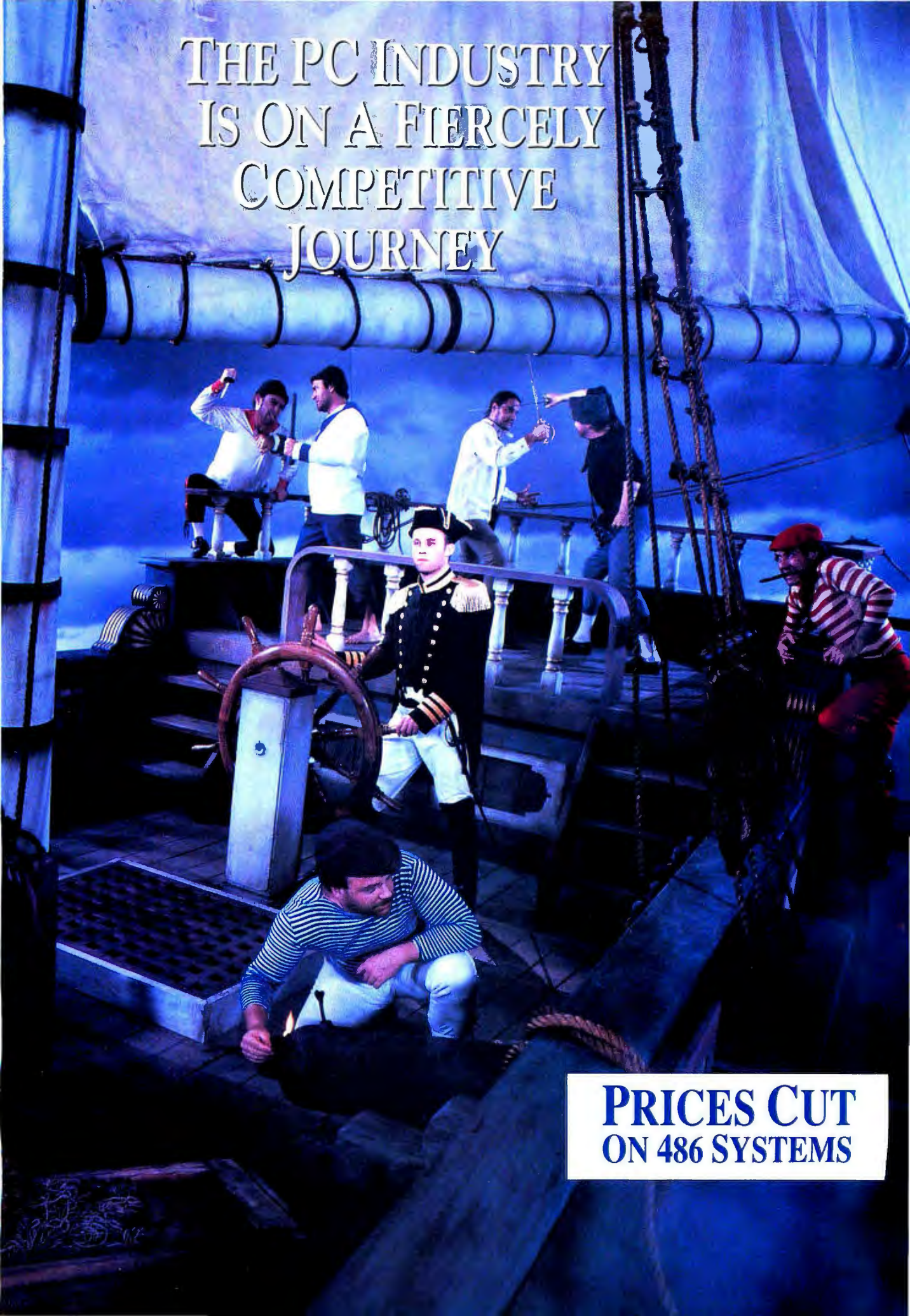
Lotus is developing a visual programming application called Notebook that lets you integrate relational data with Notes data. The company demonstrated how you can query sales data in a Sybase database and put it live into a window next to a Notes database using visual programming methods. Applications created with Notebook can be distributed through Notes. Lotus's chief technical officer **John Landry** said that Notebook offers CASE "where the graphical representation of the data is not just a description of the system, it *is* the system." □



The first week of April is usually associated with the opening day of major league baseball, but for industry observers, it was more like **open season on operating systems**, as IBM, Quarterdeck, and Microsoft all strove to capture the market. IBM developers had to work down to the wire, but the company released the general-availability version of OS/2 2.0 by its self-imposed deadline of March 31. Quarterdeck announced the release of Desqview/X at the Federal Office Systems Exposition in Washington, D.C. And Microsoft's Bill Gates used the occasion of his Windows World keynote speech at Comdex to launch Windows 3.1. □

Microsoft may have the marketing muscle, but it hasn't yet released a 32-bit operating system. However, the company will probably release a beta version of **Windows NT** (New Technology) in July to independent software vendors. The company has already implemented a controlled beta-test program for NT with a few hundred customers. □

Shortly after MiniStor Peripherals' announcement, **NEC** announced a 1⅛-inch 85-MB hard drive. □


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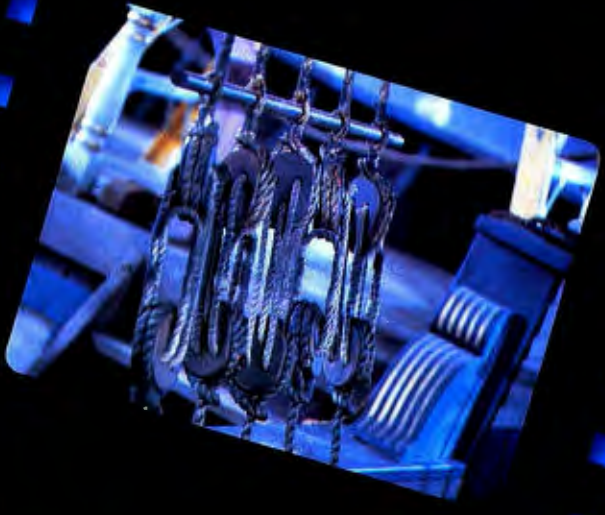
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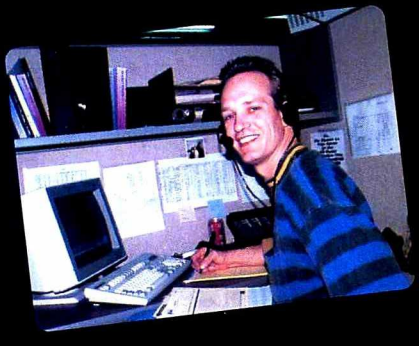
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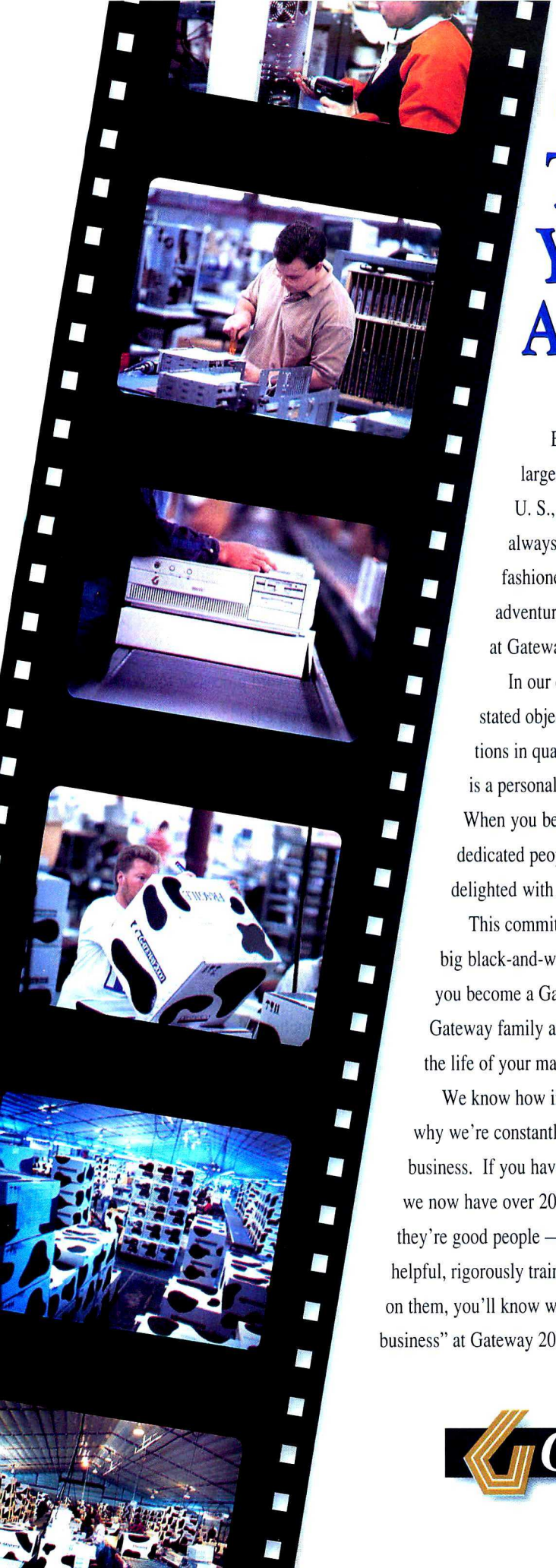
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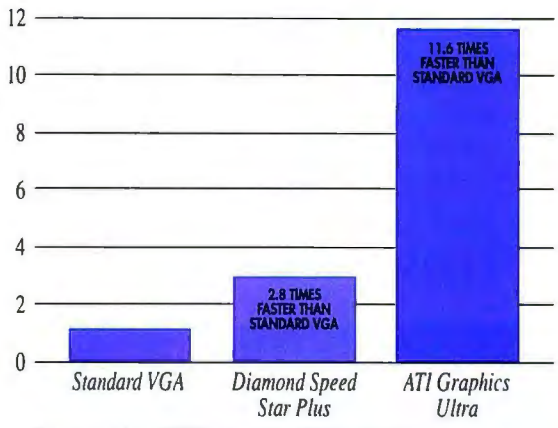
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ATI Graphics Ultra Performance Comparison



Figures computed on a 486DX/33 and provided by ATI Technologies Inc.

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- 1 Parallel/2 Serial Ports
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- Standard configurations also include: 16MHz 386SX, 20MHz 386SX, 25MHz 386DX, 33MHz 486DX EISA. Call for details and pricing.

** Battery life was measured using PC Magazine's Battery Rundown Test with power management enabled. Actual results may vary depending on configuration and applications.*

All prices and configurations are subject to change without notice. Prices do not include shipping. Components, peripherals and software are sold only with the purchase of a system, or to customers who already own Gateway 2000 systems. Some limitations apply.

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newly defined type of 10.5-mm-thick PCMCIA slot. It also uses only about half as much power as a typical 2½-inch drive, MiniStor says.

An amendment to the PCMCIA 2.0 standard, approved in February, defines a thicker slot type called a Type III cavity. You can install into one of these 10.5-mm slots two of the thinner (3.3-mm or 5-mm) PCMCIA-compatible cards or one thick device, such as the MiniStor MiniPort 32P hard drive. Either way, the electrical and logical interface to the system is the same.

MiniStor will also deliver three other models this year: embedded 1⅜-inch drives in 32- and 64-MB capacities (the latter uses two platters) and a removable 64-MB drive that uses a nonstandard 13.5-mm slot. All the drives include IDE interfaces and large read/write buffers that MiniStor says boost performance by two to eight times over competing 2½-inch drives.

End users will see MiniPort drives in systems before the end of the year; several are slated to be announced at Fall Comdex, MiniStor says. The only other 1⅜-inch drives now on the market are from Integral Peripherals, a spin-off of defunct PrairieTek. The drives are thicker and are not designed for PCMCIA slots. Conner, Quantum, and other players are expected to announce 1⅜-inch drives, but for now, MiniStor has the lead.

At $425 for engineering samples, MiniPort drives will cost less than equivalent-size solid-state disks. This lower cost will delay yet again the obsolescence of hard drives by silicon storage. Also, drives smaller than 1⅜ inch may be announced soon.

—Andy Reinhardt

Instant Gigabytes?

In an announcement that has generated quite a bit of interest and more than a healthy dose of skepticism, WEB Technologies (Smyrna, GA) says it has developed a utility that compresses files larger than 64 KB to about one-sixteenth their original size. Furthermore, WEB Technologies says its DataFiles/16 program can compress files that the program has already compressed.

Conventional compressors typically are doing well when they can reduce a file to one-half its original size. WEB Technologies' claim of 16-to-1 lossless compression, if true, would be a remarkable coup. In fact, according to the company, virtually any amount of data can be compressed to under 1024 bytes by using DataFiles/16 to compress its own output files multiple times.

A basic tenet of a long-studied branch of computer science called *information theory* says there is a theoretical minimum amount of space (bits or bytes) required to represent any given set of information (i.e., a file). Different files can be represented in different amounts of space, depending on the degree of entropy, or *randomness*, they contain. Files containing predictable sequences of information can be compressed significantly; files containing random information cannot be compressed at all. Text files, which often hold repeated or predictable sequences, have relatively little randomness and can often be represented in half their original space. Program files are usually more random than text files and are correspondingly less compressible. According to information theory, the act of compressing a file increases its randomness and reduces or eliminates its capacity for further compression.

According to Earl Bradley, WEB Technologies' vice president of sales and marketing, the compression algorithm used by DataFiles/16 is not subject to the laws of information theory. The company's spokespersons have declined to discuss the nature of the algorithm.

WEB Technologies released a beta-test version of DataFiles/16 to this reporter for a preliminary evaluation. The program did create archive files that were compressed to the degree that the company claimed. The beta version decompressed these files into their original names and sizes, but, unfortunately, the contents of the decompressed files bore little resemblance to that of the original files.

WEB Technologies' representatives met with a BYTE news editor and demonstrated the program's ability to successfully compress a text file three times without losing the data. But at press time, this reporter wasn't able to test the latest beta version of the utility, and so couldn't verify the company's revolutionary claims.

The DOS version of DataFiles/16 (Mac and SCO Unix versions are waiting in the wings) was to have shipped in March. The company now claims that the product will ship by May 1. If it does, information theorists will have a lot of explaining to do, and you ought to be able to fit the contents of the Library of Congress on your floppy drive. ■

—Russ Schnapp

NANOBYTES

Kodak is planning a huge push for its Photo CD products. The company intends to have more than 200,000 Photo CD outlets nationwide this month. At these outlets, customers can turn in rolls of film or sets of negatives, and Kodak will develop them, scan the resulting image, color-balance it, and return a Photo CD containing five digital versions of each photograph. □

Apple says it will support Kodak's Photo CD images in future versions of **QuickTime**, giving Mac users direct access to Photo CD images from within their applications. □

Apple has released the **Mac LC II**, which is based on the Motorola 16-MHz 68030 processor. Like the original LC, the Mac LC II integrates color text and graphics, sound input, and the ability to run Apple II software on an optional Apple IIe Card. The LC II replaces the machine that Apple says has become its most popular color Mac. □

At IBM's OS/2 2.0 rollout, **Paul Pignatelli**, owner of the Corner Store (Litchfield, CT), was so enthusiastic about the new operating system that he literally left Borland's Philippe Kahn speechless. When Pignatelli received a beta version of the operating system, he decided to sell OS/2 2.0 as the only operating system at his computer store. According to Pignatelli, using a 16-bit operating system on a 32-bit processor is like never getting past second gear in an expensive sports car. "OS/2 assuages these almost moral perplexities," he said, and it will bring the personal computer world "miracle programs" that will be subsumed into our entire culture. □

Go Corp.'s PenPoint mobile operating system, which was released in April, could support cursive-handwriting recognition by the end of this year, thanks to an arrangement with Paragraph International, a Russian-American developer of handwriting-recognition technology. ■



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The Best of Comdex/Spring

RICH MALLOY

BYTE editors pick the best products at Comdex/Spring

The scene was a small conference room high up in a Chicago hotel. Fourteen editors were huddled around a table littered with product literature, soft-drink cans, and several partly eaten Chicago-style deep-dish pizzas. The editors, tired and hoarse from running around the Comdex/Spring show for two days, argued, yelled, and voted for 3 hours. At the end, we had accomplished our goal: selecting the winners of our Best of Comdex/Spring Awards. And this year, the job was particularly gratifying because it was the most exciting Comdex/Spring many of us had ever attended.

What made this year's annual spring computer trade show exciting was something that was usually in the background at these shows: software. Most shows of the past were dominated by hardware. But now, with some hardware products being relegated to the role of commodities, the emphasis had to change.



Photo 1: *The Zenith Z-Note family of notebooks received the Best System and Best of Show Awards. Included in the family is a 6½-pound notebook with an active-matrix color LCD.*

Best Software

With a whole building devoted to Windows, it is not surprising that the finalists for the Best Software Award are Windows applications.

One of these finalists, from a new division of Xerox called XSoft, is Rooms for Windows. With this $99 software, you can divide Windows into a series of desktops called rooms, each one customized for a particular application. Once you have your rooms set up, you can quickly switch between them.

Another finalist for Best Software is another program for making Windows more manageable: Outside In for Windows from Systems Compatibility. This $89 utility lets you view spreadsheet and database files, as well as almost every word processing file imaginable.

The winner of the Best Software Award is a database program: Approach for Windows from Approach Software (see photo 2). This $399 program makes it easy to create and manage a relational database, and it lets you quickly create high-quality data-entry forms and reports. The software can also access data in dBase, Paradox, and Oracle SQL (Structured Query Language) files.

Best System

A finalist for Best System is the well-designed T386SX notebook from Librex Computer Systems. This $2499 5-pound system sports a removable hard drive and a PCMCIA expansion slot, a 9½-inch VGA monochrome LCD, and an external floppy drive.

Another finalist is the impressive T4400SXC color notebook from Toshiba. This 7¼-pound system combines a 25-MHz 486SX chip with an 8½-inch active-matrix LCD and a 3-hour battery. The color screen can display 256 simultaneous colors at the standard VGA resolution of 640 by 480 pixels. With an 80-MB hard drive, the price is $7699.

The winner of the Best System Award is the new Z-Note family of notebooks from Zenith Data Systems (see photo 1). Each unit includes an Intel 386SL processor, nickel-hydride batteries, and an Ethernet network connector. The notebooks range from the Z-Note 320 Model 60 (with a 10-inch monochrome LCD, a 20-MHz 386SL, and a 60-MB hard drive; it weighs just under 6 pounds and costs $3599) to the Z-Note 325Lc Model 120

(with a 25-MHz 386SL, a 120-MB hard drive, and a 9-inch active-matrix color LCD; it weighs 6½ pounds and costs $7299). One of the nice features of these systems is their expandability.

Best Peripheral

One finalist for Best Peripheral Award is the amazing CJ10 color copier/scanner/printer from Canon. This device uses Canon's Bubble-Jet technology to print striking color images at a resolution of 400 dots per inch. As a copier, it can copy a page in about 90 seconds at a cost of less than 60 cents per page. It can also function as a 400-dpi color scanner and a color printer. The price will be less than $10,000.

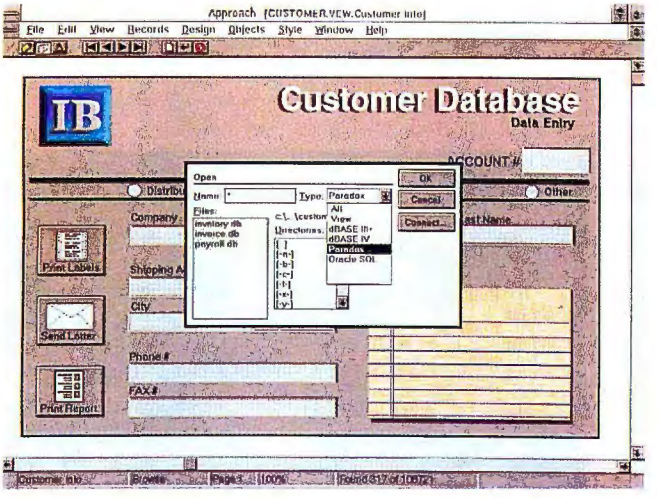


Photo 2: *The Best Software Award went to Approach for Windows, which lets you easily create a relational database.*

Another finalist is a high-end multimedia product: Studio from Matrox Electronic Systems. This set of five EISA cards turns an MS-DOS system into a broadcast-quality video-editing facility. The price is relatively high, $10,000 to $16,000, but it's still only a fraction of the cost of equivalent video equipment.

The Best Peripheral Award went to what is probably the first ecologically correct printer: the Ecosys aSi from Kyocera Electronics. This small-footprint LED printer is Hewlett-Packard-compatible and can print 10 pages per minute at a resolution of 300 dpi. But its most fascinating component is its print drum, the surface of which is a layer of amorphous silicon. The toner is packaged in a biodegradable container made from kelp. Printing costs are less than 1 cent per page. The company claims that over the lifetime of the printer, the cost savings will pay for the printer itself, which costs $2395.

Best Rookie

One of the finalists for Best Rookie is a longtime veteran of the high-fidelity market, but a newcomer to computers. The company is Altec Lansing, which was introducing its Multimedia computer speakers. These speakers have a unique folding design and an incredible sound. The price starts at $300.

Another finalist for Best Rookie is DeltaPoint, for its $495 graphing package called DeltaGraph Professional for Windows. This new arrival from the Mac world lets you easily create an assortment of business and scientific charts.

The Best Rookie Award went to a German company called Fast Electronic for its Video Machine, a multimedia expansion board that will be available in September for 386-based PC clones and Apple Mac IIs. By inserting the $4000 Video Machine into a computer and adding two VCRs, you will have a full broadcast-quality video editing and mixing system.

The Best of the Best

The winner of the Best of Show Award was the Z-Note family of notebooks. We liked the built-in networking capability, the lightweight active-matrix color screen, and the expandability. Yes, we had seen some impressive notebooks from other companies, but the Z-Notes looked like the best notebooks—and also the best product overall.

Our congratulations go to the finalists and winners. But the real winners are you, the people who will soon have access to these new products. ■

Rich Malloy is an executive editor for BYTE in New York. He can be reached on BIX as "rmalloy" and on MCI Mail at #306-6564.

THE FACTS

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Toshiba America Information Systems, Inc.
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Video Machine
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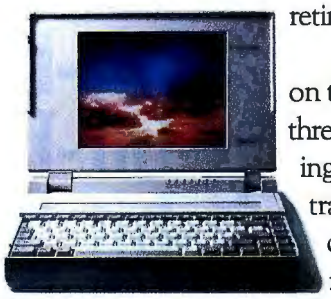
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PC Magazine
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PC Tech Journal
June 1988

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A 66-MHz Executive Jet

JOHN W. DONOVAN

HP teams a double-speed 486 with a local bus for supersonic performance

I'll get right to the point. Hewlett-Packard's expandable EISA Vectra 486u is the fastest system we've tested in the BYTE Lab (see the table). The system I looked at was equipped with one of the first preproduction versions of Intel's groundbreaking 66-MHz DX2 processor. You won't be able to buy a 66-MHz Vectra until the chips become available in quantity, probably sometime this fall. In the meantime, you can buy a Vectra equipped with a 25-, 33-, or 50-MHz (clock-doubled) processor.

For those who buy now, HP is offering an unbeatable deal. If you purchase a Vectra 486DX2-25/50 before September 1, you will receive a certificate for a free 486DX2-33/66 processor upgrade.

The Sum of Its Parts

While the 66-MHz processor is the media star of the Vectra 486u, as processor speeds pour on the afterburners, it's necessary to make some major changes in the rest of the system. A quiet revolution has been brewing recently in systems design. Engineers are breaking through the performance barrier imposed by ISA and EISA system buses, which are far too slow to allow fast processors to hit their stride.

Enter the *local bus*, which can deliver the performance potential of 25- and 33-MHz 486 systems. Because it operates at three to four times the rate of a system bus and avoids the overhead of bus arbitration, the local bus delivers much greater throughput than your typical I/O bus.

When you add Intel's clock-doubled CPUs (see "Intel's Double-Fast CPUs," May BYTE) to local-bus technology, the bottom line is groundbreaking performance at surprisingly reasonable prices. Even though HP uses the "Jet" moniker only for its laser printers, I couldn't help but think "Executive Jet" as I tested this early model of the Vectra 486u. Coupling two breakthroughs in one system, the Vectra 486u is a clean-slate design aimed at delivering performance, simplifying upgrades, and streamlining system administration.

A Path to the Future

The Vectra 486u's upgrading provisions start with a motherboard built around a local bus that can run at 25 or 33 MHz. With these speeds, most 486 processors (except the 50-MHz 486DX) can enjoy the substantial performance benefits of *fast* communications with key functions. The current selection of processors includes the 486SX at 25 MHz, the 486DX at 25 and 33 MHz, and the clock-doubled 486DX2 at 25/50 and 33/66 MHz.

But there's more. A socket next to the CPU implements Intel's *overdrive* scheme, letting you use Intel's user-installed upgrade processors like the 487SX.

continued



◀ **Photo 1:** *The Vectra 486u works at jet speed using Intel's clock-doubling processor and the local bus.*

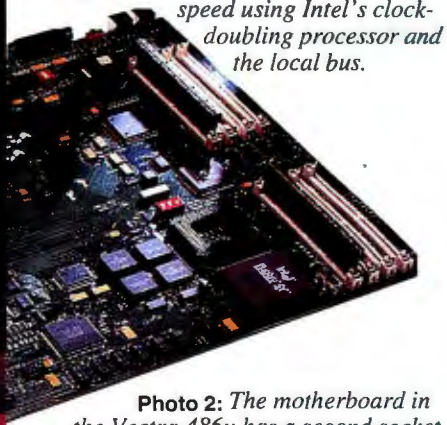


Photo 2: *The motherboard in the Vectra 486u has a second socket to implement Intel's overdrive scheme.*

PRELIMINARY LOW-LEVEL BENCHMARKS

I ran BYTE's low-level benchmarks on the prerelease Vectra 486u system with three different processors, which showed the effects of upgrading a system's processor and speeding up its internal communications. The Sieve, Sort, Integer Math, Floating-Point Math, and Fourier tests clearly show the results of increasing the 486's internal speed from 33 MHz to 50 and 66 MHz. At 50 MHz, the figures for the DX2 are essentially identical to the results for a full 50-MHz 486DX. At 66 MHz, the results far outstrip those of any 50-MHz 486. Similarly, the results of the Move tests show the effects of boosting the speed of the local bus from 25 to 33 MHz.

	486DX2-33/66	486DX2-25/50	486DX-33
CPU tests			
Sieve	200.20	150.14	115.11
Sort	23.87	17.92	12.18
Integer Math	980,236.58	735,121.94	512,733.10
Move (byte)	149.77	112.22	149.75
Move (word-odd)	199.61	149.56	180.35
Move (word-even)	299.38	224.30	299.31
Move (Dword-odd)	299.28	224.23	234.53
Move (Dword-even)	598.43	448.17	579.01
FPU tests			
Fmath	497,516.60	373,115.96	248,752.78
Fourier	8.49	6.37	4.24

Tests are measured in iterations per second. Higher numbers indicate better performance.

HP has obviously put a great deal of thought into making the upgrade process as painless as possible. The Vectra 486u circuitry automatically sensed which processor/memory configuration I'd installed.

Built for Speed

The pieces of the Vectra 486u are designed and integrated for fast computing. HP's implementation of the local bus connects the CPU (through a 128-KB write-through cache) to up to 64 MB of page-interleaved memory, a fast graphics accelerator, a controller for the five-slot EISA bus, and the system's peripheral controller.

How fast does the local bus operate? Whether or not it's the fast express line is determined by the external speed of the processor. For example, the clock-doubled 486DX2-25/50 calls for the local bus to operate at 25 MHz, while the 486DX-33 and the 486DX2-33/66 increase the speed to 33 MHz. The combination of a choice of processors and two bus speeds provides a unique chance to see how these key determinants of system performance interact (see the table).

On the graphics side, speed is boosted by a fast graphics accelerator card with up to 1 MB of VRAM (video RAM). Operating at a 70- or 72-Hz refresh rate at resolutions of up to 1024 by 768 pixels and with up to 256 colors, the video subsystem comes with enhanced-mode drivers for Windows, AutoCAD, and a dozen other applications.

Built for Comfort

The 486u system I previewed bore all the marks of thoughtful design and thorough engineering that HP is known for. For example, I configured the system to stand horizontally or vertically by repositioning the front control panel (and nameplate), and I removed the case without the use of tools in a matter of seconds. Inside the system, I had fast access to all the major components—which gave me the ability to upgrade the processor in under a minute.

HP's careful attention to thermal management, including a variable-speed fan that adjusts to the system's internal temperature, ensures reliability. While benchmarking the system, I made measurements of the CPU's operating temperature that testified to the effectiveness of the design. The 486DX-33 measured a cool 92°F, and the 486DX2-25/50 ran at 110°F, both conservatively within their rated operating ranges. The 486DX2-33/66 was supplied with an impressively large heat sink bonded to its package. Given the measured temperature of the 50-MHz version, it's not clear that the heat sink is necessary, but it's a further indication of conservative engineering. This system is built to last.

Simplifying System Management

The system even speaks English. The Vectra 486u's designers have replaced the cryptic diagnostic messages of most personal computers with a ROM-resident diagnostics and troubleshooting utility. Failures detected on power-up are displayed with a list of recommended actions. The HPView diagnostics utility lets you call up displays of system configurations and internal settings. Automatic configuration lets you easily add EISA boards.

Security hasn't been forgotten, either. You can access the system only by using HP's password-control procedure at start-up or by pushing a keyboard lock button. Further security provisions let you lock out access to some disks and ports or set the floppy drive to read-only.

The Vectra 486u should be shipping as you read this in all but its 66-MHz DX2 version. If you're considering buying one, I recommend opting for the 50-MHz version now. The free upgrade to a 66-MHz engine is too good a deal to pass up. ■

John W. Donovan is a technical editor with BYTE. He can be reached on BIX as "jwd."

THE FACTS

Vectra 486u
The minimum configuration includes 4 MB of RAM, a 52-MB hard drive, and 512 KB of VRAM. With a 25-MHz 486SX, the price starts at $2999; with a 33-MHz 486DX, it starts at $3499; and with the 25-/50-MHz DX2, it begins at $4199.

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Vermont Views v.3.0
Vermont Creative Software

For years, the folks at Vermont Creative have been known for providing one of the most comprehensive character-based interfaces available. Consider that the previous release of this product came with 13 pounds of documentation! Over and above this remarkable attention to programmer needs was a universally admired interface that could do more with character-based interfaces than most people would want to do with graphical user interfaces.

Version 3.0 lives up to this reputation. The library now stretches to nearly 600 functions, explained in three stout manuals that total over 2,000 pages. The new version sports an interactive screen and forms designs whose output can be loaded directly by the application or serve as input to a bundled C code generator. The library has deepened its capabilities to edit data as it is input, continued to add functionality to windowing capabilities, and finally added mouse support, the one feature it previously lacked.

Also bundled with the package is shrouded source code, so you can recompile the libraries for other compilers. Commented, human-readable code is available separately and is a model of self-documenting code—the way libraries should be written but rarely are.

The wide scope of the library, its portability (to UNIX), the extraordinary quality of the implementation, and its stunning documentation (accompanied by 90 sample programs), along with the design tools and code generator, make Vermont Views the first choice among high-end packages for character-based interfaces.

—Andrew Binstock
(Editor, Unix Review)
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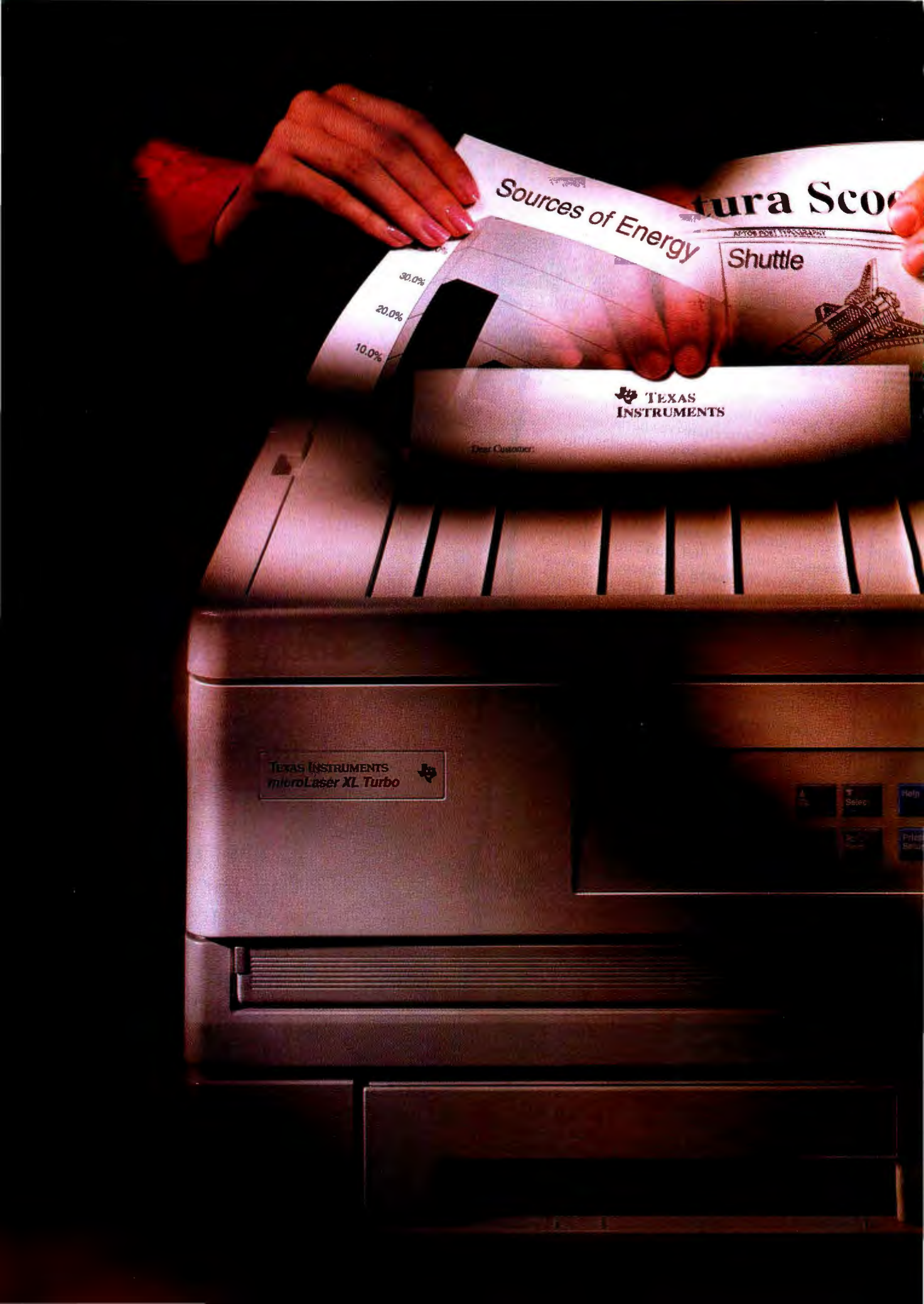
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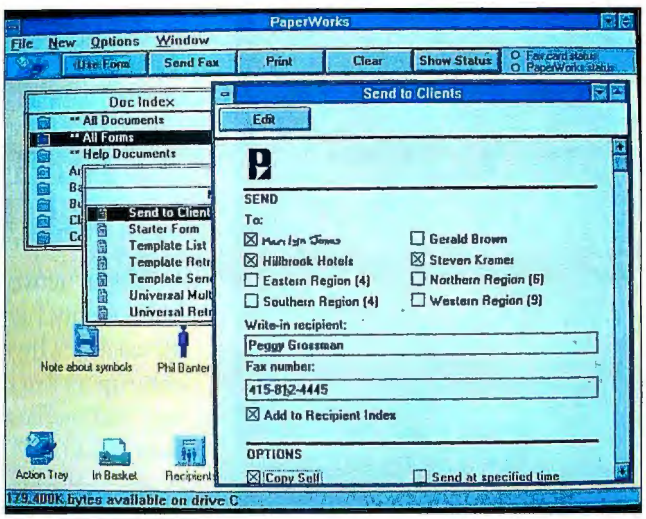
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The concepts behind PaperWorks sound simple at first, but they hide a rich set of features, numerous new patents, and the beginning of a flood of upcoming products. You install PaperWorks software in a PC (at least a 386 with 4 MB of RAM) equipped with Windows and a send/receive fax card. You can then control your PC from any fax machine, anywhere.

A few examples are in order. With PaperWorks installed on my PC in Peterborough, and access to a fax machine from my hotel in San Francisco, I can have my computer send me a list of faxes I've received while I've been traveling. I can then send a fax requesting that any or all of the faxes be forwarded to my hotel's fax machine.

But that's not all. Let's say I have a fax that I need to send to several locations. I can send PaperWorks the fax I want to distribute, with a list of the people I want it distributed to. PaperWorks takes care of it all.

Often when I'm traveling, I gather notes and releases that I won't be able to use until I return to the office. I could, of course, carry it all back with me. With PaperWorks, however, I can fax the documents back to my computer and have them ready and waiting for me when I return.

There have also been numerous times when I've been traveling and found I've left an important document at the office. PaperWorks will fax the document to me, at any hour, without human intervention back at the office.

Essentially, PaperWorks turns my office PC into a document storage and information center. The applications are virtually unlimited. The key to using PaperWorks is a set of forms that Xerox calls SmartPaper. There are various forms for sending, retrieving, and storing documents. If you need more forms, you just make a copy.

"Aha," you say. "What if I forget to take the forms with me?" No problem. All you do is fax your PaperWorks-equipped PC a blank sheet of paper. It will fax you back a "universal multipurpose form" that will let you perform any PaperWorks function.

PaperWorks has multiple levels of security. Each PaperWorks package has forms that have a unique identification that's virtually impossible to forge. Your system will recognize only those forms. (There are other levels of protection too extensive to go into here.)

Although PaperWorks uses its own intelligent character recognition to read some information on its forms, its forte is dealing with *images* of documents, essentially large graphics files. That's not as limiting as it sounds. PARC's teams of "social anthropologists" spent a great deal of time studying the way people work with documents while in the office and while traveling. Their conclusions aren't really surprising: Most documents start as paper and end up as paper. In the interim steps, they are also handled as paper images. This is where PaperWorks shines.

But it doesn't end there. PARC scientists tell us that PaperWorks is only the first in a series of PaperWare products that will be introduced in the next few years. It's a safe bet that future PaperWare products will make good use of PARC's new patents for the computerized handling of text.

Currently, PaperWorks requires one of four generally available fax boards: Intel's Satisfaxtion, The Complete PC's The Complete Fax or The Complete Communicator, or Singapore Technology's CEI proFax. Xerox says other fax boards will be added to the list in the near future.

Installing PaperWorks is easy, although the more information you give it at the beginning (e.g., a distribution list of people you regularly send faxes to), the easier it will be to use the software. (You can easily add other names later, locally or remotely via fax.)

When you're not traveling, PaperWorks is a first-class local fax system and document management system for your PC. The interface, although it's Windows based, is unique and uses Windows graphics to maximum advantage. Handy drag-and-drop features make the chore of managing faxes and documents much easier than the plain-vanilla Windows file manager.

PaperWorks made me do a lot of hard thinking about how I interact with my computer and my data. Ironically, it puts another nail in the coffin of the paperless office by adding more paper. But useful paper it is, indeed. PaperWorks is one of the most innovative, useful, and unique products I've seen. It goes a long way toward consummating the marriage between PC and fax.

—Stan Miastkowski

THE FACTS

PaperWorks
$249.99

System requirements:
IBM PC, PS/2, or compatible with at least a 386 processor, 4 MB of RAM, Windows 3.0, and a send/receive fax card.

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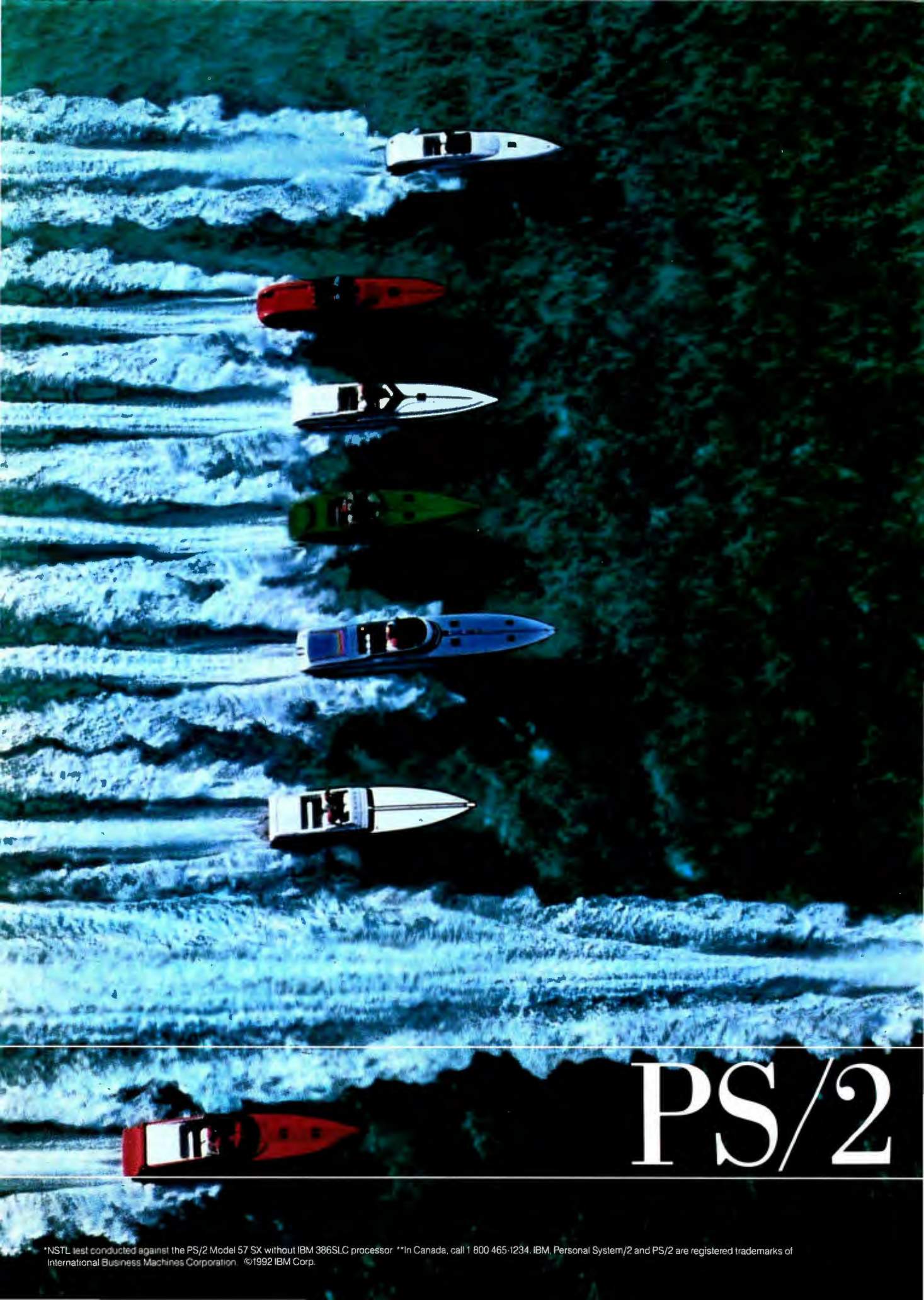
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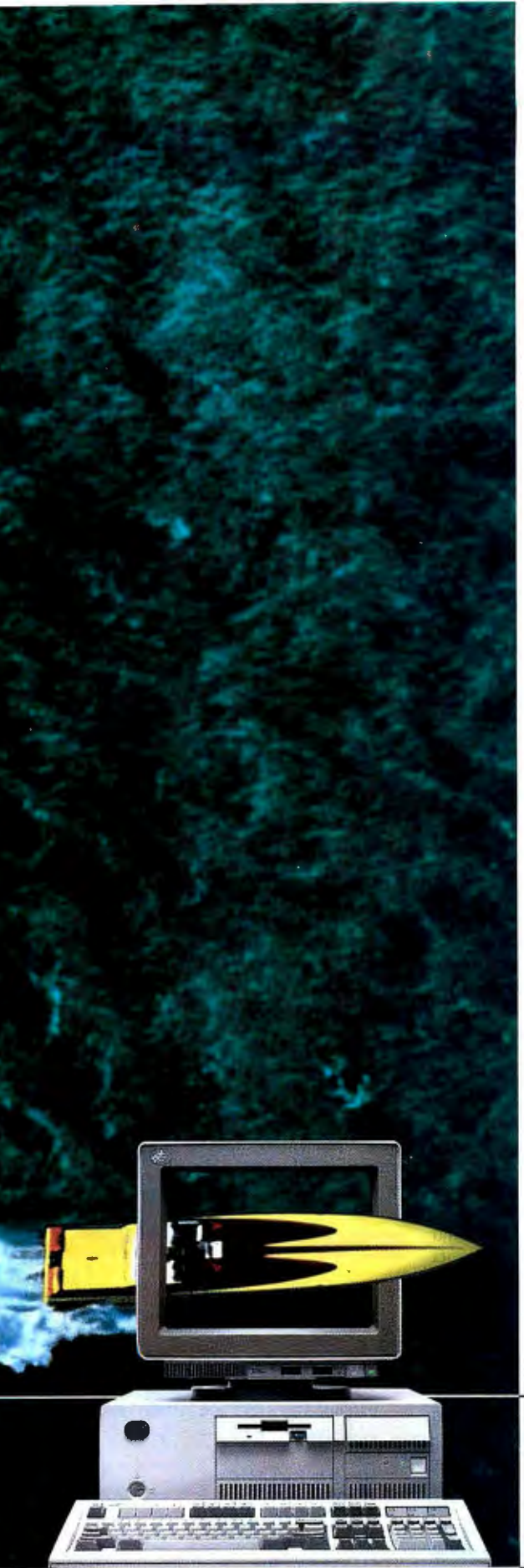
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HP's Desktop and Application Integration Solution for Windows

Hewlett-Packard has added some sparkle to **NewWave 4.0**, and the object-oriented environment remains full of features that are not available in one package anywhere else. With the introduction of Windows 3.1, Microsoft took a little of the splash of NewWave away by improving OLE (Object Linking and Embedding) and by improving its own desktop and overall operation. Nevertheless, the look and feel of NewWave 4.0 is subtly different from that of Windows, with more of a three-dimensional feel and the use of icons for more functions (e.g., an Apple-like trashcan icon). Also, windows in NewWave open and close with a zoom motion that gives the process more of an interactive feel than is present in Windows.



HP is repositioning NewWave in the market as a desktop manager, after it discovered that most of its customers thought of NewWave in that way. A feature that users particularly like is the ability to use 32-character filenames, eliminating obscure filenames like tx6-91.wks and replacing them with names like Company Taxes June 1991. Version 4.0 lets all files and folders of any type have full 32-character names.

NewWave uses a completely object-oriented metaphor for working with files and data. All files and folders are objects with attached attributes. These objects can be linked to application objects. Thus, clicking on a file will automatically launch the appropriate application. In NewWave 4.0, the object metaphor has been extended to include a drag-and-drop capability. If the icon for Company Taxes June 1991 is dropped onto the printer icon, it is automatically printed appropriately.

HP has improved desktop operation in other ways by adding full OLE 1.0 compatibility, the ability to attach files by dragging and dropping them into NewWave, and a powerful object finder that can find any object from among thousands in under a second. The enhanced software installation process in NewWave 4.0 provides a new interoperability between NewWave and DOS and Windows applications. Now, the applications are automatically available as icons on the desktop after you have installed NewWave.

Despite this emphasis on the desktop metaphor, I find NewWave most useful in the area of work automation. NewWave includes the concept of *agents*. These are software programs or macros that automate everyday tasks you perform on your computer. Typically, you create agents by example: You show the agent how you normally perform the task. The agent learns from your example and is ready to perform the task automatically, either when you tell it to do so or at scheduled intervals—or even when it's triggered by other events.

In NewWave 4.0, HP has dramatically enhanced its agents. In addition to including support for DDE, NewWave now has the ability to call DLLs to link with external programs, record and play back menu selections rather than just keystrokes, call other agents to chain tasks, be triggered by external events, and support arrays and pointers. All these features make agents far more powerful. HP didn't stop there. It also has added a visual tool, called an interface object, for building dialog-box interfaces to agents with programmable push buttons and I/O fields. In addition to push buttons, the boxes can contain text, check boxes, radio buttons, icons, edit fields, and list boxes. You can use the visual interface to create your own interface to acquire and display information.

HP includes some sample agents to help get you started, but it could do better in this important area. Although creating agents by example is useful for many tasks, to move beyond that and have agents call one another and work together, you must start programming the agents using the built-in control language. More examples in the desktop manager would help newer users get started. Despite this single minor flaw, HP's agents are far superior to the macro capabilities of other desktop and integration programs. This capability is what truly sets NewWave apart.

HP even managed to improve installation by automatically detecting and attaching applications. NewWave 4.0 also requires less disk space than the previous version. HP accomplished this by removing NewWave Write (which seemed to be getting little use) and eliminating operation under Windows real mode.

A few things are still missing in NewWave 4.0. It needs to operate better in a network environment, something that HP is working on. It needs to integrate fully into OLE 2.0, another area where HP is at work. Currently, you cannot install NewWave as the default desktop, replacing the program manager. As of now, this makes sense for NewWave. But if HP really wants its product to be a Windows desktop, it must improve its capabilities in these areas.

Despite these shortcomings, it is hard to beat NewWave for automating work under Windows and for making Windows easy to use. We'll just have to wait for NewWave 5.0 to wash up on the shore to smooth out the final ridges in the sand.

—Owen Linderholm

THE FACTS

NewWave 4.0
$195

System requirements:
Windows system with 2 MB of extended memory and 10 MB of disk space.

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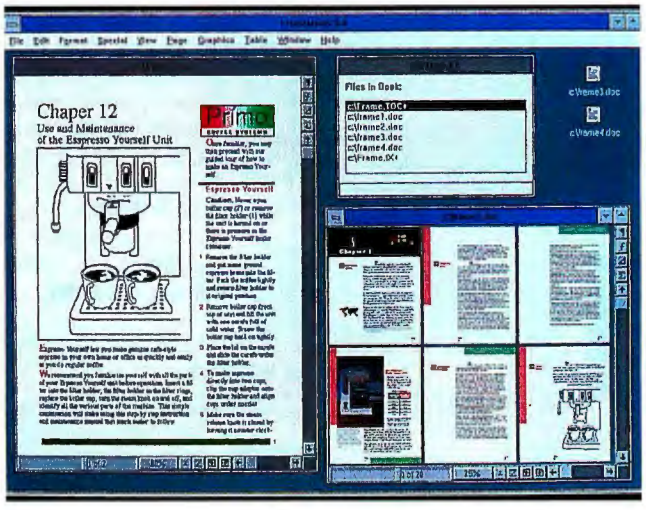
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FrameMaker for Windows: The Powerful Publisher Comes to PCs

Windows users who have been looking for maximum desktop publishing power can call off the hounds: FrameMaker is here. Born under Unix and moved to the Mac, **FrameMaker for Windows** represents a new level of document publishing for PC users.



Although it's geared toward long documents and technical material, FrameMaker can be used to assemble virtually any kind of publication. It's got your basic layout tools, which are frame-based. The modus operandi centers around placing frames—resizable rectangles—on the page and filling them with text, images, tables, and other elements of a publication. You can manipulate frames either graphically—by clicking and dragging and stretching handles—or through dialog boxes, and you have the choice of using the mouse or keyboard for practically every operation.

In addition to layout and design tools, FrameMaker has sophisticated typesetting controls. It's especially adept at setting complex text (e.g., equations and formulas). Like other desktop publishing packages, FrameMaker lets you use style sheets to apply formatting commands to text.

This is as Windows-like an application as you'll find. It doesn't just look and act like a Windows program: It conforms to the more advanced functions of Windows, such as OLE (Object Linking and Embedding) and the multiple-document interface. Like other powerful Windows applications, FrameMaker devours memory. The company calls 4 MB the bottom line but rightly recommends 8 MB. In my tests, the program hummed along pretty well on anything from a 33-MHz 386 on up. On a 20-MHz 386, however, actions like scrolling could get tedious. For WYSIWYG word processing, FrameMaker is quite fast.

Frame Technology has implemented the concept of conditional text. This lets you have one master document that contains a bunch of variations. For example, say you've developed a software product that comes in Windows and Mac versions. Much of the manual will apply to users of both types of machines, but some of it will be specific to just one group of users. You can tag the Mac-specific sections as conditional. When it's time to print the manual for the Windows version, you tell FrameMaker to hide the Mac-specific text. It essentially becomes invisible to the printer. When it's time to print the documents for the Mac version, you turn the conditional switch off.

FrameMaker is an upstanding global citizen. It lets you work with FrameMaker documents from one platform to the next. I've taken Mac FrameMaker files, shipped them across the network, and opened them under Windows. The same transportability applies to the Unix versions. With its stack of import filters, FrameMaker can pull in text and graphics of just about any format.

As we were going to press, Frame Technology still had some big bugs to knock out of this program. I worked with an alpha version, so bugs were to be expected. Most of the functions were operative, but UAEs (unrecoverable applications errors) and other mysteries of the Windows universe were fairly frequent occurrences. Frame Technology is known for solid products, so it's a good bet that FrameMaker for Windows won't ship until it's been shaken down.

FrameMaker's publishing capabilities are reason enough to buy it. Add its cross-platform consciousness, and you can't beat this program. Its ability to coexist in a mixed-machine environment is one of the wonders of FrameMaker. Any office with a variety of networked computers, with people using a variety of word processors, should seriously consider adopting FrameMaker as its document publishing system. Nothing can match it.

—D. Barker

THE FACTS

FrameMaker for Windows
$795

System requirements:
A 386 with a minimum of 4 MB of RAM and 10 MB of hard disk storage.

Frame Technology
1010 Rincon Cir.
San Jose, CA 95131
(408) 433-3311
fax: (408) 433-1928
Circle 1196 on Inquiry Card.

Buttoning Up Procomm Plus

Call me skeptical. I've used the DOS version of Procomm Plus since it was shareware. My fingers have become accustomed to its Alt-key commands. I know the dialing directory like the back of my PC compatible. So why would I want a Windows version of Procomm Plus?

Well, to start with, **Procomm Plus for Windows** has an Action Bar, a row of iconic buttons along the top of the window that lets you perform the most common telecommunications functions with a single click: dial, hang up, send and receive files, run scripts, capture incoming text to a file or printer, scroll back through the previous lines you've sent or received, and change your communications setup. If you have a high-resolution Windows display (i.e., 800 by 600 pixels or higher), you also get buttons that allow you to clear the screen, record scripts automatically,

Now that WordPerfect users prefer Microsoft Word for Windows, we're spreading the Word.



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We're calling it "The Word Challenge." And in the weeks to come, we'll be traveling coast-to-coast testing WordPerfect® for DOS users to find out which word processing program they prefer for everyday word processing tasks.

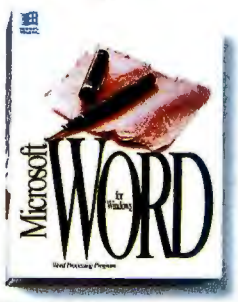
NSTL TEST RESULTS, DECEMBER 1991

	Word for Windows	WordPerfect for Windows
Preferred to use	79%	21%
Easier to learn	71%	21%
Easier to use	83%	13%
Would purchase	79%	21%

It started last December when, in a test conducted by the National Software Testing Labs, nearly eight out of 10 WordPerfect for DOS users preferred Word for Windows™ over WordPerfect for Windows.

As excited as we were about the results, we're even more excited about the prospect of finding out if WordPerfect users all over the country feel the same way. So, we're taking the NSTL show on the road to ten cities. Everywhere from Washington, D.C. and Minneapolis, to Dallas, Salt Lake City and Los Angeles.

Call for a free "Word Challenge Kit." Included is a videocassette highlighting the test, and interviews with WordPerfect users who took the challenge. Also in the kit are the files you need to test Word on your own. Call (800) 323-3577, Department Z49. We think once you judge for yourself, you'll want to take advantage of our special $129 upgrade offer.* Then, no doubt, you'll end up spreading the word for us.



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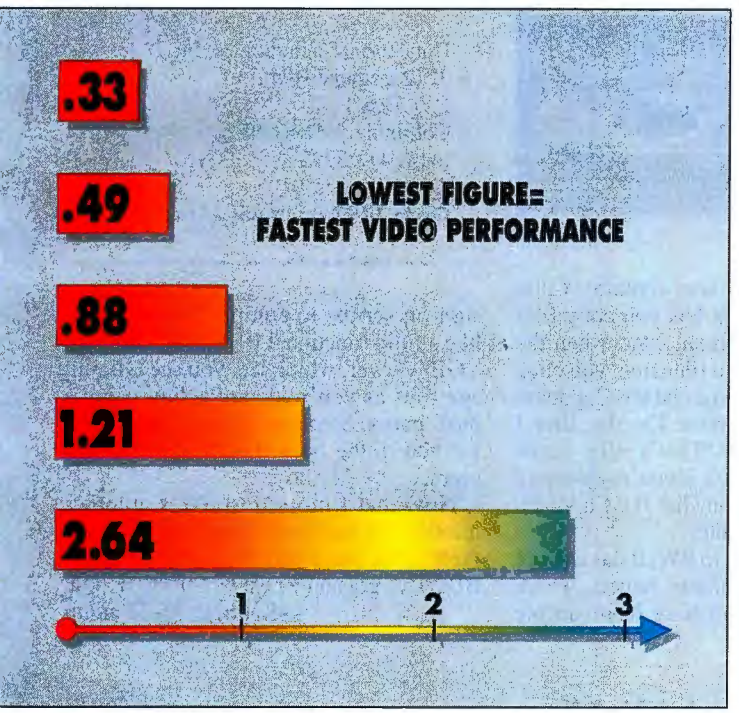


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PC Magazine Labs (5.0)
Video Performance Test: Direct Screen Access

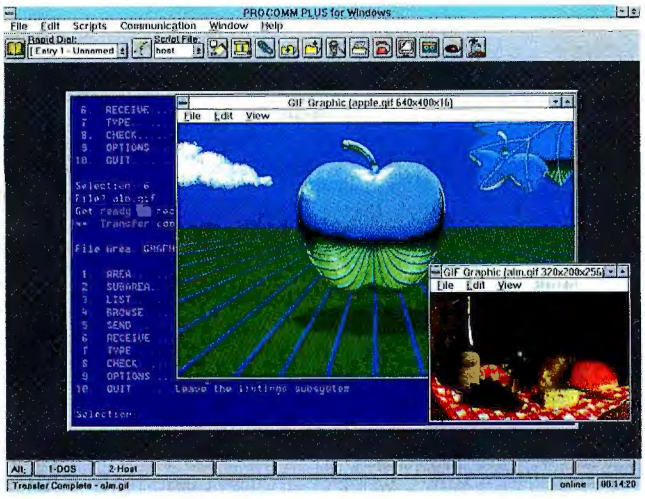
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compile or edit those scripts, and play back a text file you've captured.

"So what?" I thought. I could do most of those things in the DOS version of Procomm Plus with one or two keystrokes. What I'd really like is the ability to adapt the Action Bar for each on-line system I call. Call me picky.



Lo and behold, Procomm Plus for Windows (hereafter, PW) provides a row of *meta-key* buttons at the bottom of the window. You can define up to 40 keys (based on the numerals 0 to 9, Alt, Alt-Shift, Alt-Control, and Alt-Shift-Ctrl). A click on a meta-key button lets you send a text string, run a DOS or Windows program, or execute a script file. You can create a distinct group of meta-keys for each on-line system that you use; the keys appear automatically when you call that system. I'd much rather click on a button than go rummaging through MCI's documentation because I have forgotten the command for editing a half-written message.

PW's Action Bar also contains a File Clipboard button that lets you copy filenames from your screen; later, when the host system asks for a filename, you click on the appropriate name and the Clipboard sends it back to the host. The first time I tried that, I thought, "That's silly—even *I'm* not *that* lazy." But if you're choosing several files from a long list, the Clipboard becomes indispensable.

There's a lot more to PW. It has a script language called Windows Aspect, which lets you create everything from simple sign-on scripts to complex applications like a fully functional BBS; DDE support; a GIF viewer, which lets you see GIF image files as you're downloading them; a push-button help system (not fully implemented in the beta version I used); and more.

Now that I'm used to PW's graphics niceties, it's hard to imagine doing without them. Call me a believer. Or call me on BIX; I've got some neat buttons to try out.

—Kenneth M. Sheldon

THE FACTS

Procomm Plus for Windows
$149; upgrade for owners of DOS version, $69

System requirements:
Windows 3.0 or higher, a hard drive with 2 MB of free space, and a modem.

Datastorm Technologies, Inc.
3212 Lemone Blvd.
P.O. Box 1471
Columbia, MD 65205
(314) 443-3282
fax: (314) 875-0595
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The Fastest LAN Alive

If you have fast workstations and a fast file server, you'll also want a fast network. Even 16 Mbps may be too slow if your applications are data-intensive. I took a look at a set of **TCNS** network cards from Thomas-Conrad. The version I saw should be available by the time you read this. The network card operates at 100 Mbps and costs only slightly more than token-ring cards. TCNS gives you the advantages of the Fiber Distributed Data Interface without FDDI's high price. I found that NetWare, LAN Manager, PowerLAN, LANtastic, and other ARCnet-compatible network operating systems work well with TCNS. The catch is that you must use fast computers to realize performance gains.

TCNS uses the same shielded twisted-pair (i.e., IBM type 1) or coaxial (i.e., RG62A/U) cabling already in place for token ring or ARCnet. You can also install 62.5-micron fiber-optic cable. Using a TCNS Smart Hub with different connectors gives you the option of mixing and matching cable types. You wire a TCNS network as a distributed star, just as you would with ARCnet or token ring. TCNS adapters and hubs use ST connectors for fiber-optic cable, BNC connectors for coaxial cable, and DB-9 connectors for shielded twisted-pair cable.

Imagine ARCnet running at 100 Mbps, and you have a good picture of TCNS. A TCNS network adapter is register compatible with an ARCnet adapter, which lets TCNS use industry-standard ARCnet software drivers. Thomas-Conrad also supplies Accelerated Drivers for an even greater performance boost. TCNS workstations use the same reconfiguration process as ARCnet when they enter or leave the network. Over the LAN cable, though, TCNS uses FDDI's 4B/5B encoding scheme to send and receive the ARCnet packets. It's the best of both worlds.

TCNS consists of network adapters with shielded twisted-pair, coaxial, or fiber-optic connectors; one or more Smart Hubs; and software drivers. The adapters come in 16- and 32-bit and ISA- and EISA-bus varieties. You can put up to 255 TCNS workstations on a single LAN segment, and you can span large distances: 2950 feet (hub to workstation) with fiber-optic cable, 492 feet with shielded twisted-pair cable, and 338 feet with RG62A/U coaxial cable.

A TCNS adapter contains an AMD TAXI chip set. Thomas-Conrad developed the firmware and microcode for TCNS by layering its own chip designs on top of TAXI. The 4B/5B encoding scheme lets TCNS transmit 4 data bits as 5 signal bits, making it 80 percent efficient.

TCNS cards, like most token-ring cards, use 16 KB of upper memory. I was easily able to configure 386Max to load DOS

BEFORE PROTECTING YOUR SOFTWARE...

...against piracy and unauthorized use, make sure that your protection system has all the following qualities:

A GOOD HARDWARE KEY

Hardware-based software protection systems are now the standard worldwide. However, not all keys are the same. A good key should have all the following features:



✔ Compatibility and transparency. The key should work without any problem on your customers' computers. The user should be able to forget the key after connecting it.



✔ Unbreakable electronics. A customized ASIC (Application Specific Integrated Circuit) component should be integrated in the key. This prevents reverse engineering and makes cracking virtually impossible.

✔ A unique and inaccessible software developer's code burnt into the ASIC. (This code should not be held in the key's memory, where it can be read and altered.)

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✔ Very low power consumption, enabling the key to work even under the worst power conditions, on PCs and laptops, with or without a printer.

POWERFUL SOFTWARE



Since it's practically impossible to crack or duplicate a key having all the features mentioned above, a pirate will usually go for the software linking the protected program to the key. Therefore, check that your protection software has all of the following:

✔ A Linkable Protection Module with which calls can be made to the key from any point in the protected program.

✔ An "Envelope" installation program. Such programs enhance security while making it possible to protect a software even without its source code.

✔ Sophisticated antidebugging and encryption mechanisms.

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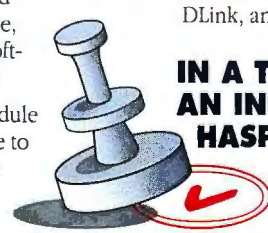
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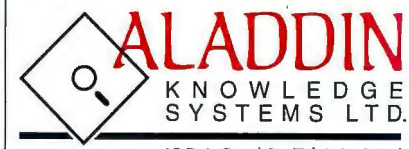
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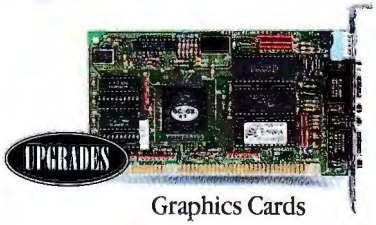
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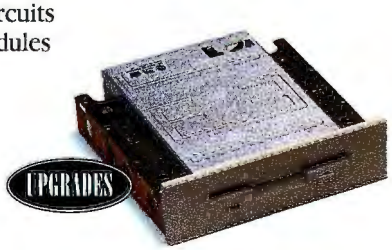
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and my TSR programs in upper memory around the TCNS card. The on-board RAM is zero-wait-state memory.

How fast is TCNS? I tested a set of TCNS cards on my LAN. With a 33-MHz 486 EISA-bus file server running NetWare 3.11, and with a set of workstations that includes 33-MHz 386 computers as well as an old IBM PC, I found that the workstations could read and write files to and from the server about as fast as they could read and write files to a workstation RAM disk. The BYTE LAN benchmarks measured TCNS's message-passing speed at 700 KBps. That's quick. TCNS definitely eliminates the network cables and network adapters as a bottleneck.

If you use an old, slow IBM XT on a LAN, you don't need TCNS. I noticed that TCNS didn't help my original-issue, five-slot IBM PC perform any better than Ethernet, token ring, or ARCnet. But fast workstations are different. A 386 workstation will operate faster than some networks can deliver the data. TCNS eliminates the network bottleneck for such workstations.

Datapoint announced a 20-Mbps ARCnet-Plus product almost two years ago, but it has yet to ship it. The fiber-optic version of TCNS has been available for about a year, but the shielded twisted-pair and coaxial TCNS cards and hubs are new. A cost of $745 for a 100-Mbps, 16-bit copper-based network adapter—in a fast workstation or server, of course—is a reasonable price to pay for performance.

—Barry Nance

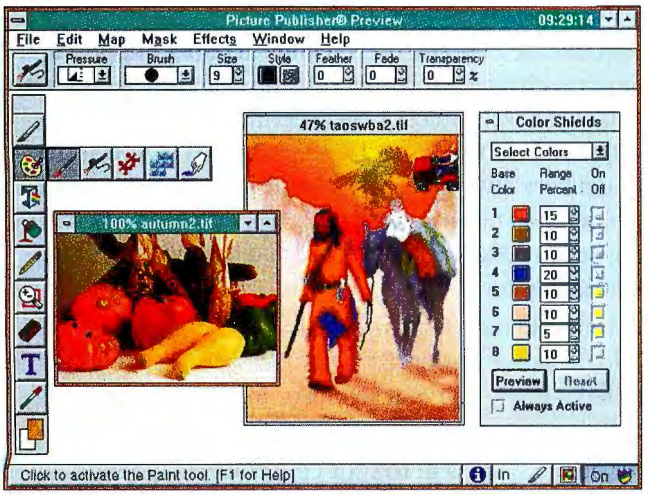
THE FACTS

TCNS
TCNS network adapters, $745 to $1595; Smart Hubs, $1995 to $2495

System requirements:
NetWare, LAN Manager, LANtastic, or any ARCnet-compatible network operating system.

Thomas-Conrad Corp.
1908-R Kramer Lane
Austin, TX 78758
(800) 332-8683
fax: (512) 836-2840
Circle 1198 on Inquiry Card.

The Many Masks of Picture Publisher 3.0



Not long ago, you needed a Mac to perform editing wizardry on your color bit maps and scanned images. But some new Windows 3.0 image editors have changed that—take a look at **Picture Publisher 3.0** from Micrografx.

For starters, the prerelease version of Picture Publisher that I looked at featured a decidedly tidier interface. Just below the standard menu bar, a ribbon area displays the available options for the active tool. The tools are stored in a movable toolbox, which is neatly organized into broad categories. Subcategories expand when the general tool is selected.

Picture Publisher's most impressive features stem from its masking capabilities. You can create an unlimited number of masks using standard shapes, a freehand tool, or a magic wand that automatically traces around a selected edge. The magic wand is a handy tool offered by many packages, but it doesn't always follow the pattern you have in mind. Picture Publisher's goes a step further. You can click from point to point, and an auto-masking tool traces along a line between each click. This gives you more control while still freeing you from the harrowing task of tracing along an irregular edge.

Once you've created the mask, you can save it or copy the enclosed image to a named clipboard, a texture, or even a custom brush. You can limit most operations to the area within a mask or apply them to everything outside the mask.

Another spiffy feature, color shields, lets you select or protect up to eight colors at once. You can easily change all the greens in an image to a deeper shade or transform a blue sky into a red one without obscuring a bank of white clouds.

The tricky task of integrating a pasted object into an existing image has never been easier. Using color shields, you can selectively remove the unwanted color surrounding a pasted object.

Picture Publisher 3.0 supports many file formats and color models. Print options enable automatic color separations and color adjustments for specific output devices. With the text tool, you can do some fun things with text.

You'll be hard-pressed to find anything that Picture Publisher can't do. Image editing on the PC has definitely arrived. ■

—Stanford Diehl

THE FACTS

Picture Publisher 3.0
$795

System requirements:
A 386 PC with 4 MB of RAM, a 40-MB hard drive, Windows 3.0, a mouse, and a VGA display (Super VGA is recommended).

Micrografx, Inc.
1303 Arapaho
Richardson, TX 75081
(800) 733-3729
(214) 234-1769
fax: (214) 234-2410
Circle 1199 on Inquiry Card.

OUR COMPACT NOTEBOOK JUST GOT 30% BIGGER



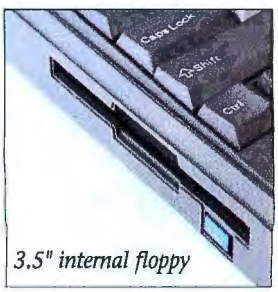
...AND PACKING FOR TRIPS JUST GOT

Now there's less to worry about when you're packing for a business trip. Got your airline ticket? The right clothes? Your presentation materials? You'd better check. But when it comes to your notebook computer, you won't have to worry when you carry an Express 325NXL. Because the 325NXL now packs an 80MB hard drive! That's a 30% increase over our old 60MB. So you can fill it with applications and data — and always have them handy. There's plenty of room! With its built-in trackball and fax/modem, 4MB of RAM, 25MHz of 386SX speed and the amazing, utility-filled DR DOS 6.0, you won't be leaving features at home for portability's sake, either. And you'll have cash left for traveling. Because the 325NXL is *ONLY $2,095*



Even with all these features, the 325NXL weighs less than 6 pounds — including battery — and measures only 8.5" x 11". It fits comfortably into your briefcase. But just in case you want to pack it separately, we give you a free carrying case.

Look at our video display. It's sharper than other notebooks'. ✔ A big 9.4" screen, measured diagonally ✔ With 64 levels of grayscale for a bigger, clearer image than notebooks with only 16 or 32 levels. ✔ .30mm dot pitch ✔ A super-twist backlit liquid crystal display. ✔ Or hook up to a VGA monitor using the 325NXL's external VGA video connector.



3.5" internal floppy

When you run Windows on the road, this is the notebook to use. ✔ Our 80MB hard drive and 4MB of RAM mean big Windows programs run just fine. ✔ Use DR DOS 6.0 data compression and your drive can hold up to 160MB! ✔ Transfer data easily with a 1.44 MB 3.5" internal floppy drive.

Why carry a clip-on trackball? The 325NXL has one built-in so you'll always have a trackball for Windows applications. ✔ 200dpi for accurate pointing. ✔ Two click buttons select icons and commands. ✔ In the office, connect a mouse using the 325NXL's external PS/2 mouse connector.



Add a coprocessor

You won't have to wait until you're in your office to get to work. And you won't have to wait for your data while you're using your 325NXL. ✔ Our 25MHz 386SX microprocessor is faster than most other notebooks', which typically run at only 16MHz or 20MHz. ✔ Add a math coprocessor, and applications that use floating point instructions will run even faster. ✔ Order a coprocessor with your notebook and we'll install it for you.

Communication is so important on the road, you shouldn't have to pay extra to add it. ✔ So the 325NXL has a built-in 9600 baud fax / 2400 baud modem. ✔ And *FREE* Quick Link II fax/modem software. ✔ The 325NXL has one RS-232 serial port and one parallel printer port so you can connect to printers and other peripherals, too.

You'll feel right at home on our keyboard. ✔ It has the familiar IBM feel because it's made by the same manufacturer. ✔ The standard 101-key function keyboard is implemented with 84-key layout. ✔ And the inverted "T" arrow keys are just like your standard keyboard's — in the lower right hand corner and easy to find. ✔ Connect to a standard PS/2 keyboard with our external keyboard connector.


Inverted "T" arrow keys

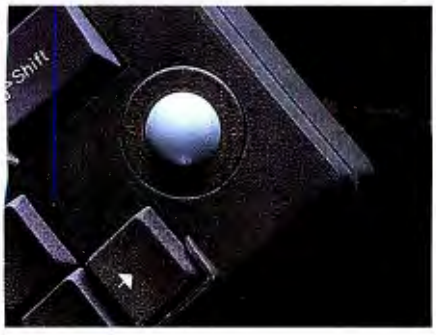
You won't be stranded without power. ✔ Because the 325NXL's built-in power management logic gives you 3 to 4 hours of battery life. ✔ Close the lid, and a sleep button shuts down the display and drives but preserves your data. ✔ Our AC adapter is compact and easy to take with you.

Ordering's a breeze, too. Just call us toll free at: *800-925-3525*

EASIER



Free carrying case



Built-in trackball



1 serial, 1 parallel port; fax/modem; keyboard; mouse; VGA monitor connections.



Power, display control, sleep buttons on keyboard

We accept MasterCard, VISA, money orders, certified checks (please allow ten days for processing), CODs ($50 deposit required), company and institutional purchase orders (minimum initial purchase $250, thereafter $50 with approved credit) and wire transfers. Shipping charges are calculated according to weight and distance. Texas residents, please add appropriate local sales tax. CompuAdd Express will replace or repair defective hardware, software and consumable items. A 15 percent restocking fee may be charged. All return items must be accompanied by a return merchandise authorization (RMA) number. Prices and product descriptions are subject to change without notice. CompuAdd Express is not liable for damage due to omissions or typographical errors.



Express 450DX2

$2,395

120MB AND NI-HRVGA

When you want to travel fast, get on board the Express 450DX2.

Announcing: Our fast 450DX2 with clock doubling technology. Get all the power and features of a 486DX. But get them with 70 percent more speed! And with Express economy! You save money because we build our 450DX2 around the clock doubling DX2 chip — leaving out the unnecessary DX chip that many manufacturers include. We save you technical worries, since our one chip runs cooler than the other guys' two. But we give you full 486DX power, including built-in coprocessor and on-chip cache. Plus enhancements like 64KB RAM cache on the motherboard and a non-interlaced monitor.

You'll also have Express controllability. Because the 450DX2 comes preloaded with DR DOS 6.0, the operating system that includes a data compression feature that can give you up to double the normal space on your hard drive. And Express expandability. Because you get our standard dual floppy drive that frees two bays for extra hard drives, a tape backup or CD ROM.

Systems for Every Need

The 450DX2 is our most powerful system. But for computer users with less demanding needs, we offer a full line of 486DX, 486SX, 386DX and 386SX systems. All with Express enhancements like our dual floppy drive and DR DOS 6.0. And all with amazingly low prices!

433 - $2,195
486DX/33MHz; 120MB HD; NI-HRVGA

420s - $1,895
486SX/20MHz; 80MB HD; NI-HRVGA

333 - $1,695
386DX/33MHz; 80MB HD; NI-HRVGA

325s - $1,395
386SX/25MHz; 40MB HD; NI-HRVGA

CompuAdd Express

Call to order, for other system configurations or for a free catalog:

800-925-3525

512-219-1800 Fax 512-219-2890

Hours: 8AM-6PM Mon-Fri CST 12306 Technology Boulevard, Austin, Texas 78727

Circle 89 on Inquiry Card.

Crisp Color Goes Portable

The UltraLite SL/25C notebook computer supports multiple resolutions on its TFT (thin-film-transistor) active-matrix color LCD. Resolutions of 640 by 480 pixels with 16 colors and 320 by 200 pixels with 256 colors are coupled with a 60-Hz refresh rate, a dot pitch of 0.3 mm, and 256 KB of video RAM for crisp images. The machine supports simultaneous displays on its 9½-inch screen and on an external CRT display.

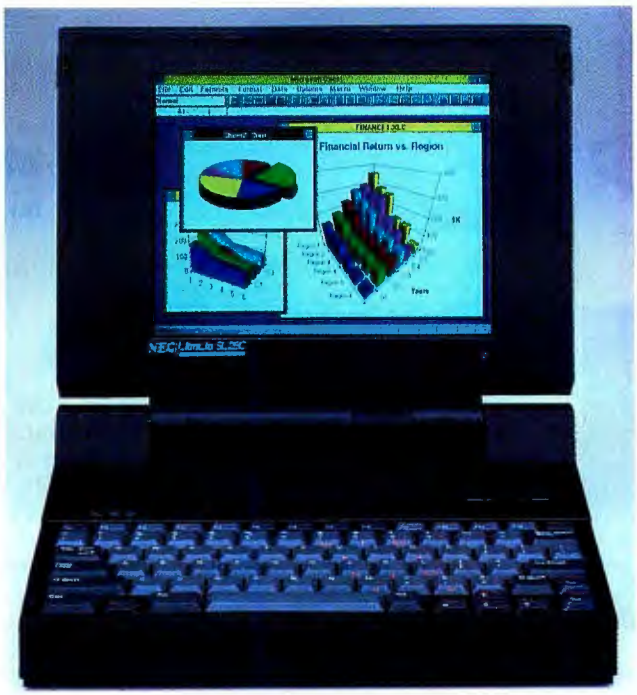
With a 25-MHz 386SL processor and an 80-MB hard drive, the SL/25C includes 2 MB of RAM (expandable to 10 MB), 64 KB of cache memory, a 3½-inch floppy drive, and four automatic power-saving modes. DOS 5.0 and Windows 3.0 are preinstalled.

Standard interfaces include serial, enhanced parallel, keyboard, keypad, PS/2 mouse, Super VGA, and external floppy drive ports. The unit has an internal modem slot and an optional docking station, which is easily transportable.

Price: $5999.

Contact: NEC Technologies, Inc., 1414 Massachusetts Ave., Boxborough, MA 01719, (800) 632-4636 or (508) 264-8000.

Circle 1271 on Inquiry Card.



The NEC UltraLite SL/25C has active-matrix color.

Alphanumerics in Windows

Based on the Display Industry Association's Alpha Window standard, the AlphaWindow Terminal from Cumulus combines the simplicity, reliability, and lower cost of standard Unix terminals with the advantages of a windowing environment. Working in Unix on the AlphaWindow Terminal, you have mouse capabilities and can move data between applications and close and open windows. The terminal supports up to 16 sessions and 22 windows, each running different applications.

The AlphaWindow Terminal has a 15-inch, nonglare, monochrome flat screen with more than 90 square inches of active display surface and a refresh rate of 75 MHz. Displays are in 80- and 132-column modes, and you can run any text-mode Unix applications within multisession windows without modification.

Price: $759; limited license software, $459.

Contact: Cumulus Technology Corp., 1007 Elwell Court, Palo Alto, CA 94303, (415) 960-1200; fax (415) 960-3522.

Circle 1272 on Inquiry Card.



AlphaWindow Terminal

Keeping in Step

Expandable and fast, the 50-MHz Step 486/50e Megacube has 12 expansion slots (10 EISA, one 8-bit, and one 64-bit proprietary memory) and supports a 33-MBps burst throughput rate. The proprietary Advanced Memory Management Architecture write-back cache is scalable from 128 to 256 KB. Standard RAM is 8 MB.

The modular unit includes the Everex Thermal Management System to lower system temperature and two variable-speed SmartFans to reduce thermal stress. Security features include system locks, a protected system power switch, and software password protection.

Price: Starts at $7899.

Contact: Everex Systems, Inc., 48431 Milmont Dr., Fremont, CA 94538, (800) 992-3839.

Circle 1273 on Inquiry Card.

Midrange Decision Making

Based on AMD's 386DXL microprocessor, the Decision 386/40 is geared toward desktop publishing, scientific analysis, and CAE. A multispeed ISA expansion bus offers turbocharged speeds of 10 and 13.33 MHz, with a default speed of 8 MHz.

Configured with 4 MB of RAM (expandable to 64 MB via 36-bit SIMMs), a 128-KB cache (upgradable to 256 KB), two serial ports, a parallel port, and DOS 5.0, the unit includes a socket for a 40-MHz 387-compatible math coprocessor. A 1.2-MB floppy drive is standard; optional 120-MB and 200-MB hard drives are available, as is a 1.44-MB floppy drive. Six expansion slots accept 8-bit and 16-bit ISA cards.

Price: Starts at $1999.

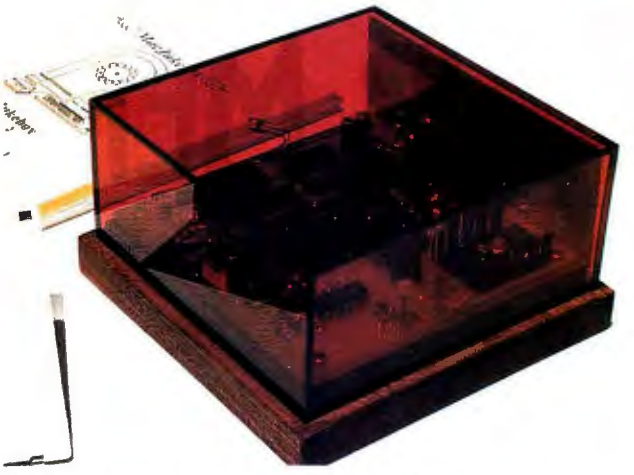
Contact: Wyse Technology, Inc., 3471 North First St., San Jose, CA 95134, (800) 438-9973 or (408) 473-1200; fax (408) 473-2080.

Circle 1274 on Inquiry Card.

Become Master of Your Equipment

Gain intelligence over your infrared equipment and control it all with a single IR command. Connected to the serial port of your Mac or PC, the IR Jukebox recognizes, transmits, and receives infrared commands to a distance of 30 feet.

The IR Jukebox has five software-selectable output channels. The single internal channel provides a 120-degree spread of IR in a room, while the four external channels let you address individual IR components. Firmware modules are built in, and you can add custom modules. When you start the software, you gain access to Channels and Jukebox modules, in which you can run IR screens by time and event and create and sort sets of CDs or record albums.
Price: $479; Developer Kit, $379.
Contact: DanCraft Enterprises, 5520 West 118th Place, Inglewood, CA 90304, (310) 643-8782.
Circle 1275 on Inquiry Card.



The IR Jukebox lets you control your infrared equipment.

Have Memory, Will Travel

A palm-size removable hard drive with 120 MB of storage, the Disctec RHD 120 has an average seek time of 15 ms and a data transfer rate of 10 Mbps. Based on the IDE interface, the 7-ounce drive is compatible with portable and desktop computers with a Disctec Docking Bracket installed. If no files are open, you can change the drive while the computer is running.
Price: $1295; docking bracket, $65 to $100.
Contact: Disk Technologies Corp., 925 South Semoran Blvd., Suite 114, Winter Park, FL 32792, (800) 553-0337 or (407) 671-5500; fax (407) 671-6606.
Circle 1276 on Inquiry Card.



3-D Mouse Has Its Feet on the Ground

Mouse Systems' 3-D mouse lets you work in CAD and do computer modeling without lifting your mouse off the desk. Incorporating the company's M5 optical technology, the 3-D mouse provides 6 degrees of freedom—*x*, *y*, *z*, pitch, yaw, and roll—and works as a 600-cpi-resolution mouse, allowing hand and arm motion associated with standard mouse use.
Price: $299.
Contact: Mouse Systems Corp., 47505 Seabridge Dr., Fremont, CA 94538, (510) 656-1117; fax (510) 770-1924.
Circle 1277 on Inquiry Card.

SCSI-2 Drive Darts Through Its Work

With no moving parts to slow it down, the SCSI II Dart drive achieves a sustained 12.16-MBps data transfer rate on a computer running DOS and an 11.9-MBps rate on Macs. The drive has a seek time as low as 0.1 ms on DOS PCs and less than 0.01 ms on Macs, and access times as low as 0.5 ms on both machines. When working with animation, the drive can deliver about 40 8-bit frames per second. The drive has 32 SIMM sockets that hold standard 1-, 4-, and 16-MB SIMMs to a maximum of 512 MB of RAM.
Price: With four 1-MB SIMMs, $4700.
Contact: Newer Technology, 7803 East Osie St., Suite 105, Wichita, KS 67207, (800) 678-3726 or (316) 685-4904; fax (316) 685-9368.
Circle 1278 on Inquiry Card.

New Shape for TrackMan

The second generation of the TrackMan stationary desktop mouse lives in a case that closely conforms to the natural shape of the human hand, putting the ball directly under your thumb when you're using the device. Thus, TrackMan operates in the same minimal space as its dimensions. The unit also features three buttons for versatility in programming in DOS and Windows. You can assign hot keys to one or two of the buttons.
Price: $139.
Contact: Logitech, Inc., 6505 Kaiser Dr., Fremont, CA 94555, (510) 795-8500; fax (510) 792-8901.
Circle 1279 on Inquiry Card.

Lightweight Portable Power

Portable IDE hard drives that plug into your laptop, notebook, or pen-based computer's parallel port range in capacity from 40 to 360 MB and are compatible with Windows 3.0 and higher. The 2½-pound drives' on-the-fly data compression uses proprietary disk controller software that takes up 15 KB of system RAM.
Price: $499 to $1999.



Contact: Parallel Peripherals Technology, Inc., 260 West Arrow Hwy., San Dimas, CA 91773, (800) 222-7240 or (714) 394-7244; fax (714) 394-7242.
Circle 1280 on Inquiry Card.

WILL YOU REMEMBER EATS YOUR MEMORY?

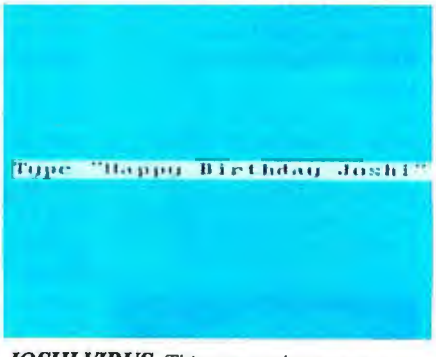


Viruses are creative little monsters that can eat up your profits.

Viruses spread very innocently from normal computer usage. Bulletin boards, hackers and malicious employees are not the problem. Almost 90% of infections come from diskettes, half from data-only diskettes and 3% from shrink-wrapped software. No one is immune. There were nearly 1,000 known viruses in 1991. Between three and five new viruses are created each day. Here are just three examples:



CASCADE VIRUS. *By the time anyone sees the falling letters, your entire site is likely to be infected.*

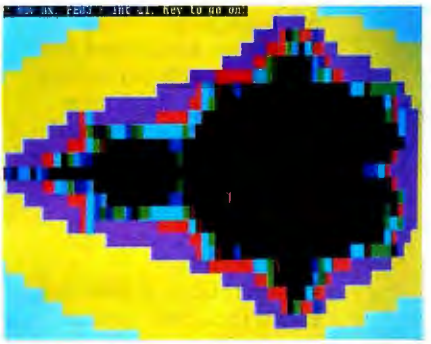


JOSHI VIRUS. *This extremely common stealth virus damages hard drives and about half the floppies it travels on.*

Just remember NOVI™ needs no updates.

NOVI prevents or detects and perfectly repairs both known and unknown computer viruses from the moment you install it. NOVI works equally well on single PCs or LANs and is fully Windows™ compatible. Although NOVI can scan for viruses faster than anything else, virus scanning is one thing you can forget about forever. Just let NOVI's patent-pending "Integrity Management" take care of your PCs. There will be no hassles, no maintenance and no user intervention. You can forget about costly and time-consuming updates also, because you won't need them.

THIS AD AFTER A VIRUS

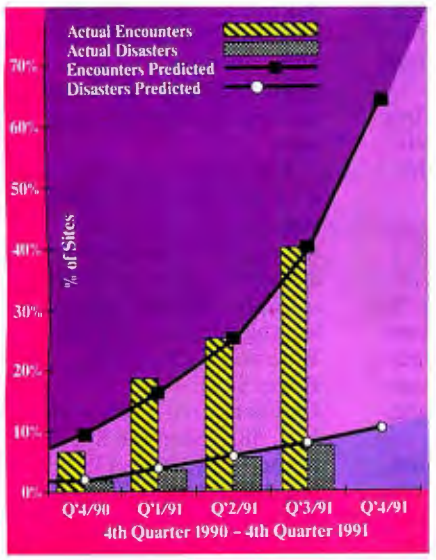


TEQUILA VIRUS. *Using advanced anti-scanner and stealth techniques, the virus infects LANs and corrupts hard drives.*

Do you think a virus could never happen to you?

Over 60% of American companies and governmental agencies are hit by viruses each quarter. The likelihood of a major virus disaster is doubling every four months.*

*All data from Dataquest/National Computer Security Association virus study (11/91).



Actual and projected percent of organizations experiencing virus disasters each quarter in North America (Dataquest).

How much are your data and downtime worth?

Viruses are no longer someone else's problem, as many businesses have discovered. When a virus hits, it can not only destroy your data and programs, it can also knock out your entire network. A virus puts you off-line until the problem is solved, while it ties up your best people for hours or days. With NOVI, you're always protected and productive.

Designed to work in corporate computing environments.

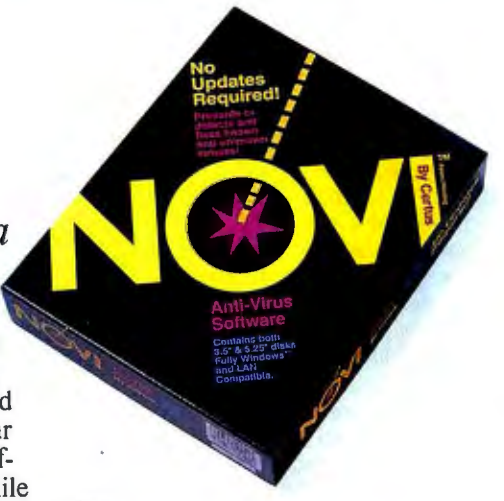
NOVI has no database to maintain, no approval lists, no user updates or maintenance. It produces virtually no false alarms, even when its known-virus features are turned off. NOVI prevents file and system areas from getting infected in the first place. But if an infection occurs, NOVI perfectly repairs it, and returns you to normal operations. NOVI can do all of this automatically and invisibly, without showing a single user message. Or it can be set up to show up to a dozen customizable messages for you and your PC security personnel.

NOVI is the first Object Oriented anti-virus system. You can choose objects and tailor their behavior exactly to the needs of your environment. It occupies from 60 to 600 KB of disk space (with two on-line manuals and a comprehensive virus information base) and as little as 1.6 KB of RAM.

Easy to install, easy to use.

Installing NOVI can be as easy as booting from a NOVI "Clone" diskette or logging onto the LAN – no questions asked. A comprehensive LAN installation can be done under a minute. Logs of virus encounters can be stored locally or sent as a message to a LAN administrator.

Circle 192 on Inquiry Card (RESELLERS: 193).



Pac pricing protects organizations at less cost.

Multiple installation users get significant savings per unit with our unique 10, 25, 50, 100, or 500 pac licenses. This eliminates hundreds of boxes and manuals and provides you with enough licensed software to handle your entire organization or LAN.

Software Digest

★ ★ ★ ★

Ranked by SOFTWARE DIGEST as *the #1* anti-virus program. (Vol. 8.11-1991) "NOVI completely out-classes the other programs with pure speed."

NOVI comes from Certus International, with a five year history of specializing in anti-virus, integrity management and systems management software.

Call 1-800-SAY-NOVI.

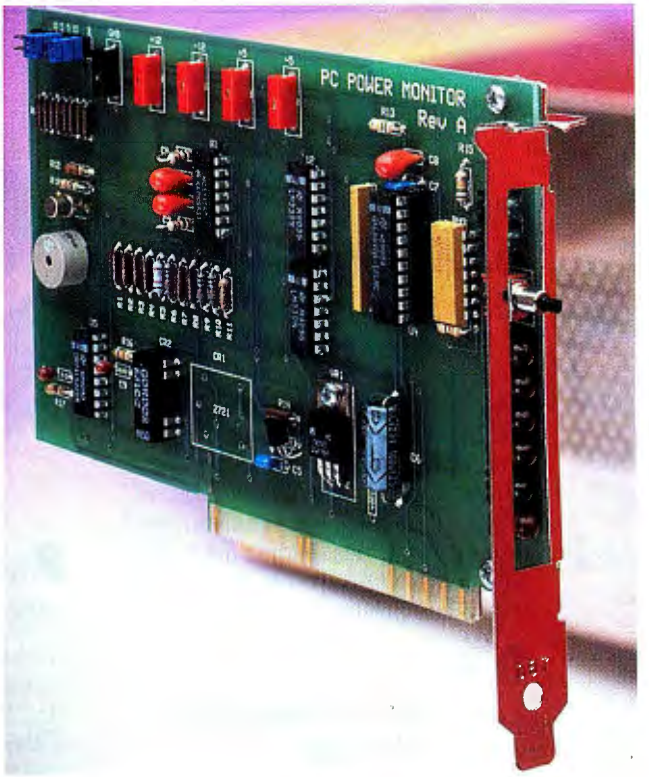
certus

Certus International Corporation
6896 West Snowville Road
Brecksville, Ohio 44141 • 216-546-1500

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Monitor Power on the Bus

The PC-Bus Power Monitor Card detects power disturbances and spots bad power supplies from its location in an expansion slot of your PC. The monitor checks to see that the supplies are within specification, detects the presence of glitches or dropouts, and displays the information on an LED array. The basic card provides a real-time indication of power quality and remembers momentary out-of-tolerance operation. The enhanced version has an audible alarm and separate monitoring circuits for the system clock and DRAM refresh signal.
Price: Starts at $195.
Contact: Wintek Corp., 1801 South St., Lafayette, IN 47904, (800) 742-6809; fax (317) 448-4823.
Circle 1281 on Inquiry Card.



Keep the bus running with the PC-Bus Power Monitor Card.

Three Routes to Video

The Artist WinSprint 200 graphics board for Windows includes a panoramic view for instant access to a 2048- by 1024-pixel-resolution virtual window in 16 colors on your 640- by 480-pixel-resolution VGA monitor. Within an application, Panorama lets you pan across twice the normal amount of data. When using dual applications, you can view two large windows, cutting and pasting between them. You can switch back and forth among as many as five open full-size windows. The WinSprint 200 displays 16 and 256 simultaneous colors at 1024- by 768-pixel resolution. The board has 1 MB of video RAM and supports VGA pass-through.
Price: $995.
Contact: Artist Graphics, 2675 Patton Rd., St. Paul, MN 55113, (800) 627-8478 or (612) 631-7800; fax (612) 631-7802.
Circle 1282 on Inquiry Card.

The Volante AT2000 displays 24-bit true color in resolutions of up to 1024 by 768 pixels. A resolution of 1280 by 1024 pixels, noninterlaced, with 16 or 256 colors, is available.

The field-upgradable AT2000 supports up to 4 MB of video RAM and 8 MB of DRAM. Mach-speed Windows and AutoCAD drivers triple the speed provided by older drivers. NDI-developed application-specific ICs are included.
Price: $1495 to $1995.
Contact: National Design, Inc., Houston Building, Suite 230, 9171 Capital of Texas Hwy., Austin, TX 78759, (512) 343-5055; fax (512) 343-5053.
Circle 1283 on Inquiry Card.

The Xceed MacroColor 30, a 24-bit video card for the Mac SE/30 and IIsi, displays true-color images on most external 13- and 14-inch monitors and supports the 12-inch Mac RGB monitor. Resolution in true color is 640 by 480 pixels (512 by 384 pixels on the RGB monitor).

The card includes a gamma color correction utility and the MacroPaint 8-/24-bit color paint program. Virtual Video utility software provides access to a larger display area than the monitor can physically provide.
Price: $599.
Contact: Micron Technology, Inc., 2805 East Columbia Rd., Boise, ID 83706, (208) 368-2100; fax (208) 368-4558.
Circle 1284 on Inquiry Card.

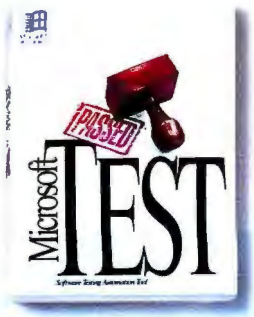
Oscilloscope Card for the PC

The CompuScope 250 supports 8-bit 100-MHz digitizing in your PC. The single-slot XT-bus oscilloscope card features 100-megasample-per-second digitization on one channel and 50-megasample-per-second simultaneous digitization on two channels. The card has 16 KB of memory depth per channel, external trigger capability, and software drivers.
Price: $3500.
Contact: Gage Applied Sciences, Inc., 5465 Vanden Abeele, Montreal, Quebec, Canada H4S 1S1, (514) 337-6893; fax (514) 337-8411.
Circle 1285 on Inquiry Card.

Put IDE Drives in Your PS/2

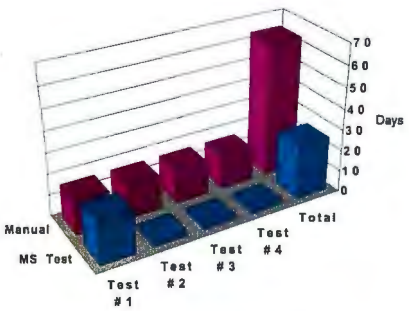
The AC-1075 IDE/Micro Channel Hard Drive Adapter upgrades your PS/2 Model 50 and Model 50 Z computers to support two IDE hard drives with up to 1 GB of RAM each. The internal adapter provides 5 and 12 V DC directly from the Micro Channel so that you can install the drives internally. Automatic drive recognition detects the drive type and sets the drive parameters.

The adapter's proprietary on-board BIOS is fully supported by DOS, OS/2, Interactive Unix, and Windows 3.0 without external software. Adapter software lets you interface with NetWare and NetWare Lite.
Price: $195.
Contact: Arco Electronics, Inc., 5830 Sheridan St., Hollywood, FL 33021, (305) 961-1666; fax (305) 964-1984.
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MICROSOFT SOFTWARE DEVELOPMENT TOOLS

Test your apps. Not your patience.



After programming your initial test, Microsoft Test can save you hours, even days, with each subsequent test.



Use a recorder to quickly create test scripts that simulate keystrokes and mouse movements in your application.

Testing your Windows™-based applications can be painfully slow. Then again, not testing them can be disastrous.

But finally you can do it fast and do it right. With Microsoft® Test for Windows Software Testing Automation Tool.

Once you've prepared your test scripts, Microsoft Test runs automatically. Without goofing up.

It simulates keystrokes and mouse movements, 24 hours a day. And it constantly evaluates your application, while recording what went wrong and what went right, and why.

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So call us at (800) 541-1261, Department A02.

We'll show you how to put your Windows-based applications through their paces. At a much faster pace.

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Key Features

- TestDriver, the environment for developing and running test scripts, includes an enhanced version of the Basic language, TestBasic, for efficient script creation.
- Functions which simulate keystrokes and mouse movements reduce testing time.
- Trap command, to trap unexpected events, such as UAEs, allows test script to stay in control.
- Recorder for keystrokes and mouse movements creates editable TestBasic test scripts easily.
- High-level English-like functions help users create test scripts quickly.
- Fast, exact comparisons between actual and expected results verify application quality.
- Screen capture and compare functions provide additional test results to verify application functionality.
- No hooks or debugging code needed, so Microsoft Test can be used with the final version of almost any application for Windows, no matter what development tool was used to create the application.

PROGRAMMER'S TIP

As an alternative to using Basic script language, call the Microsoft Test API with your favorite language, such as Microsoft Visual Basic™ or Microsoft C. Included in the product are .H and .LIB files for linking the TestCtrl, TestDlgs, TestScrn and TestEvnt functions into your C program.

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Northgate® ZXP™...Unlimited i486™

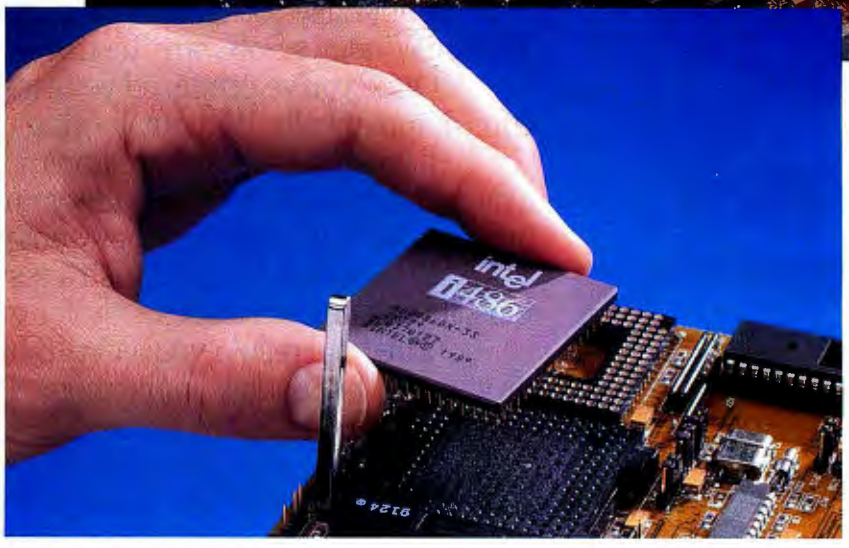
You want flexible, easy upgrades, quality, reliability and top caliber service and support at reasonable prices? Northgate delivers with Elegance ZXP systems! This spectacular new range of systems was engineered to give you the power you need today PLUS unlimited 486 upgradability for tomorrow.

Northgate is the leader in upgradable 486 technology. Factor in a choice of: Three cabinet styles, complete LAN options and legendary service and support, and you have customized computing solutions you can't get anywhere else – at any price!



Do-it-yourself ease and convenience for any upgrade!

The secret is our ZIF (Zero Insertion Force) socket. No prying and pushing. No special tools needed to handle delicate chips. Simply release the lever and effortlessly lift out the old processor. Place your new processor in the socket and press the lever down. Presto...incredible new speed! (You can even use the old processor to upgrade another ZXP system!)



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Northgate ZXP systems end your uncertainty about 486 technology. Unlike others, the Northgate ZXP systems let you maximize Intel®'s full range of upgradable CPU's – you can use any of them!

You can specify a 486SX/16 for your workstations. Later, upgrade them to SX/25...DX/33...DX2/50 and Intel's DX2/66 when available.

Our expert sales team will help you decide which processor is best for your present applications. Then, relax. No matter what your future needs are, Northgate has you covered. Our revolutionary engineering lets you upgrade your system and give it sizzling new speed – in just seconds!

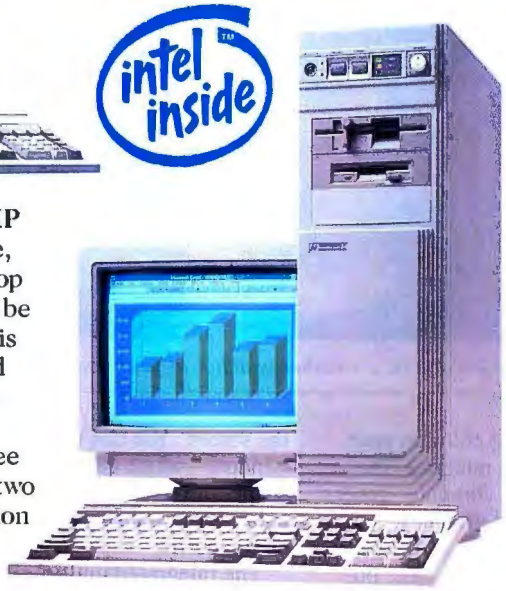


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upgradability with lift-a-lever ease!



Tower case for maximum expansion and for use as a file server! Everything about this case says "power." You get a 220 watt switching power supply and eight expansion slots – easily handles three exposed and four internal 5.25″ half-height devices, too.



To get all the advantages of ZXP technology and conserve space, Northgate's space saving desktop case is your solution. But don't be misled by its compact size. This system delivers pure power and has seven expansion slots. Features a whisper-quiet 200 watt power supply and room for three exposed 5.25″ half-height and two exposed 3.5″ devices – expansion is a breeze!



Step up to even greater expansion capability! Northgate's full-size desktop case is your best choice when space is no object. A 200 watt power supply provides plenty of power for your toughest applications. Expansion capacities include eight expansion slots plus space for three exposed and two internal 5.25″ half-height devices.

Elegance ZXP 486/33 Configuration

- Intel 80486DX/33 processor
- 4MB RAM; expands to 32MB
- 64K cache
- 100MB hard drive
- 1.2MB 5.25″ and 1.44MB 3.5″ floppy drives
- One 8-bit and six 16-bit expansion slots
- Integrated IDE hard drive and floppy drive controller
- One parallel and two serial ports
- Space-saving desktop case
- 14″ SVGA color monitor
- Northgate 101S keyboard
- MS DOS 5.0 and QBasic
- Microsoft® Windows™ 3.1 and mouse
- DiagSoft™ QA Plus™ system diagnostic/performance software
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CODE B4106

Watch the Weather with DOS

Just how blustery is it outside? Plug the WS-10 WindStation into your PC's game port and find out. An exterior-mounting wind vane/anemometer and software, the WS-10 measures local weather patterns and displays them in color or monochrome on your monitor. Average wind speed, direction, and peak gust value within the range of 0 to 125 mph are shown with a resolution of ±1 mph for speed and 22½ degrees for direction. Optional outside-temperature measurement capability for 24-hour extremes and wind-chill values is available. You can store historical data on disk for use with most spreadsheet programs.
Price: $99.50; with temperature-measurement capability, $129.50.



Contact: WeatherPort, Inc., 12036 Nevada City Hwy., Grass Valley, CA 95945, (800) 992-8110 or (916) 274-8100; fax (916) 273-6429.
Circle 1287 on Inquiry Card.

Two Presentation Systems

A combined Super VGA and digital video adapter for multimedia productions on your PC, SNAPplus captures live or still video in 24-bit true color on your monitor and integrates the images with computer-generated text and graphics. You can capture images from any video source and scale, position, process, or overlay them with your graphics. Also, you can integrate animated images from programs such as Autodesk Animator Pro into live or still video and paste the resultant image into other Windows applications. SNAPplus supports NTSC, S-Video, and RGB. The SNAPshot Desktop Video Software utility ships with the adapter.
Price: $1295.
Contact: Cardinal Technologies, Inc., 1827 Freedom Rd., Lancaster, PA 17601, (800) 233-0187 or (717) 293-3000.
Circle 1288 on Inquiry Card.



WindStation lets you be a weather watcher at your computer.

VideoShow HQ displays video from any source through a dynamic video window that can be any size and positioned anywhere on the screen. You can move the window—which can be any shape—around the screen, enlarging it and shrinking it as you desire.

The integrated multimedia system offers full-motion and live video, stereo sound, photographic images, animation, and computer graphics. VideoShow HQ can import images created with most presentation software packages. The 6-pound modular system connects directly to your monitor or other output device for output as RGB, VGA, composite NTSC, S-Video, and PAL. An optional ARC (Advanced Remote Control) unit puts a full-color 3-inch LCD in your hand for private viewing.
Price: $4999; optional ARC, $1299.
Contact: General Parametrics Corp., 1250 Ninth St., Berkeley, CA 94710, (510) 524-3950; fax (510) 524-9954.
Circle 1289 on Inquiry Card.

Provide a Safety Net for Your LAN

A comprehensive software security system, StopLight provides access control; audit tracking; protected files, directories, and peripherals; and real-time virus prevention for your network. The Windows-compatible system supports multiple user log-ins per PC, protecting the computer at boot-up by requiring a valid log-in to gain access to the hard drive. Other security is provided by keyboard lock protection and the optional SmartCard reader. StopLight has a total memory overhead of 9 KB, safe hard-drive locking, partition table mirroring, and secure recovery tools.
Price: $89 to $295 per PC.
Contact: Safetynet, Inc., 14 Tower Dr., East Hanover, NJ 07936, (908) 851-0188; fax (908) 276-6575.
Circle 1290 on Inquiry Card.

A DES Dongle

The GL306060 Hardlock-DES parallel port adapter incorporates an application-specific IC that encrypts and decrypts data using the DES algorithm. The GlenDES chip features nonvolatile 8-byte internal EEPROM for storing the DES key. The Hardlock-DES, which connects directly to your PC's printer port, is transparent to normal printer operation. The unit's key-management features support private and public key modes.
Price: $149.
Contact: Glenco Engineering, Inc., 270 Lexington Dr., Buffalo Grove, IL 60089, (708) 808-0300; fax (708) 808-0313.
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LaserJet III Emulation (PCL5)	Yes	No	No	**Yes**
Automatic Emulation Switching	No	Yes	Yes	**Yes**
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Automatic Interface Monitoring	No	No	No	**Yes**
Envelope Feeder & Cassette	No	No	No	**Yes**
Suggested List Price	$2495	$1995	$2249	**$1749**

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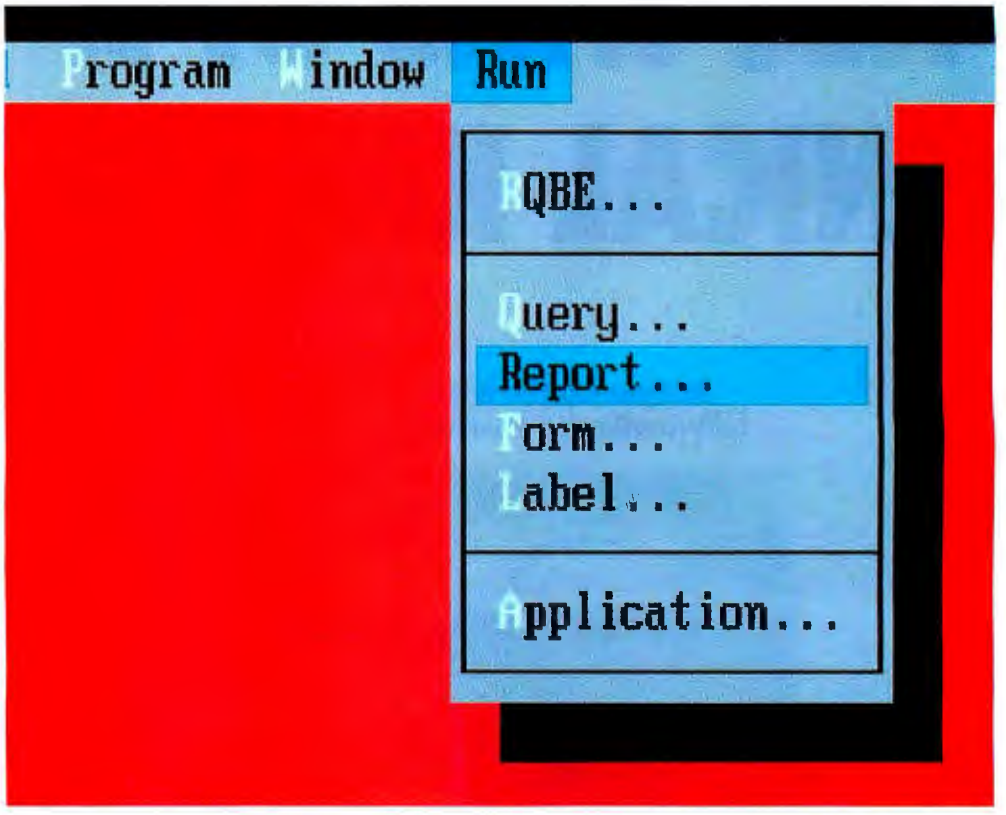
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Talk about flooring the competition! Now there's a laser printer that's fully configured for both MS-DOS® and Mac® platforms... that delivers remarkably sharp output... *and* does it all at the lowest price on the market. The fact is, the NEC Silentwriter Model 95 packs more features than any laser printer in its class. Yet it starts at a price the others bargain down to! That's just plain honest. Even more important, it lets you concentrate on what counts: great output that makes *you* look great. Look, you know your business. Make your own comparisons. Check specs, prices, quality. Once you're ready to hand down your decision... you'll agree it's no contest.

Because ⬆ is the way you want to go. NEC

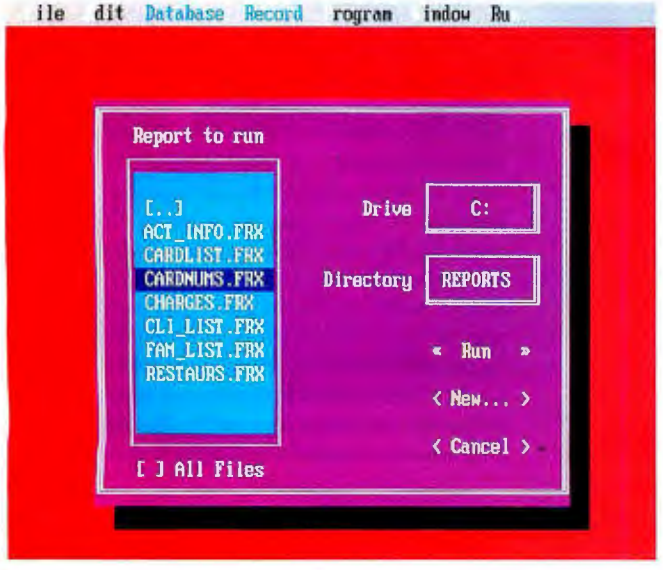
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See Fox *RUN*.



We've just added a new word to the database vocabulary: *RUN*.

And it can make you a master of your database management universe. Even if you've never managed a database before.



The most powerful PC DBMS available is now the easiest to use, too: FoxPro™ 2.0.

Pick *Run* from the FoxPro 2.0 main menu and you have instant access to your information. Click on *Report*, choose the name of the report you want, and it's yours. Do the same for queries, forms, labels and applications.

For answers on-the-fly, pick *RQBE* (Relational Query By Example) and get a simple interface for creating custom queries quickly and easily. Unlike other query systems, RQBE lets you browse the information or create instant databases, reports, labels, or business graphs (with optional FoxGraph or other graphic program).

Custom systems are easy, too.

You create quick reports, forms, labels and applications by clicking on the *New* button in the dialog box instead of picking a name from the list.

Then using our simple tools, you build forms containing buttons, lists, check boxes, text regions and data fields. Reports with headers, footers and

subtotals. And even complete applications.

All without any programming.

So while it's the most powerful DBMS you can get today, it's ideal for small businesses and large. In industry or government. For invoicing and inventory control, order entry and accounting, and all your data handling needs.

FoxPro is the state-of-the-database-art.

FoxPro 2.0 is the object-oriented, event-driven DBMS programmers have been waiting for, too.

We've added over 100 new and enhanced commands. 4GL (Fourth Generation Language) tools for creating screens, reports and menus as reusable application objects. And the ability to attach entry and exit procedures to fields, forms and windows for pre- and post-processing.

We've integrated SQL SELECT, INSERT and CREATE TABLE into the language, with the ability to use RQBE for creating SELECT statements you just cut and paste into your application code.

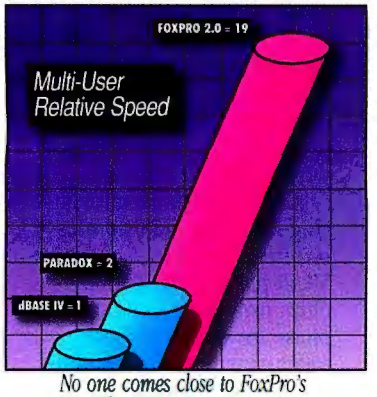
We've added a project manager on top of our debugger, trace window, and editor.

We provide an Application Program Interface (API) that links to C or assembler function libraries (Library Construction Kit optional).

And we offer an optional Distribution Kit to distribute your applications royalty-free.

Today's best choice for upgrading or downsizing critical database applications.

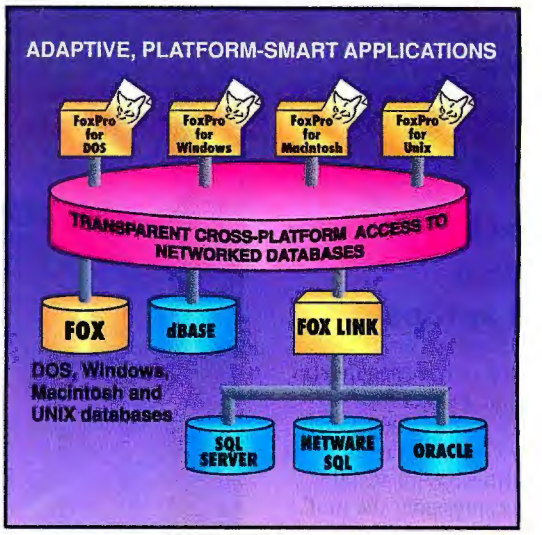
FoxPro is devastatingly faster than competitive products (see chart†– the difference is even greater in single-user tests), and has out-queried even mainframe databases like Oracle, XBD and DB2, using our patent-pending Rushmore™ query optimization.



No one comes close to FoxPro's multi-user query response.

It's backward compatible with dBASE III+/IV and earlier versions of Fox software to protect your investments in hardware, software, training, and support.

And in the few months since its release, FoxPro 2.0 has swept the awards. Best DOS Application - *Spring COMDEX*. Technical Excellence -*PC Magazine*. Award of Excellence -*Byte*. Best DBMS -*Data Based Advisor*. And many, many others from both editors and users of FoxPro 2.0.



Applications developed today with FoxPro for DOS, unlike other databases, will be able to run under Windows and SCO/UNIX and on the Macintosh when we release our new versions of FoxPro later this year.

Get a headstart on tomorrow today.

Today, FoxPro exchanges data with FoxBASE+ on Macs and on PCs running SCO UNIX. Later this year, FoxPro will be available for Windows, UNIX, and the Mac, with access to Netware SQL, SQL Server, and Oracle databases.

And applications written using FoxPro's 4GL tools will be platform-adaptive, so DOS or Windows applications will run on UNIX or the Macintosh, and vice-versa.

Which means you can get a headstart on your future by starting your Windows, Mac or UNIX development now with FoxPro on your current DOS PCs.

It comes with a 60-day money-back guarantee.

So pick up a copy of FoxPro 2.0 at your nearest computer or software store. Try it out for 60 days, then if you don't like it, just return it to your dealer for a full refund.

But we think you'll agree with Byte magazine in its 1/92 review of dBASE: "...FoxPro is the better product."

Call 1-800-837-FOX2 today.

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FOX SOFTWARE

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Circle 104 on Inquiry Card.

A Pocket Fax/Modem for Laptops

The 5-ounce Megahertz V.32 Pocket Fax/Modem features 9600-bps Group 3 send and receive fax capabilities. With V.42bis data compression, the unit can provide up to 38,400-bps throughput. MNP level 5 error correction is also included.

The Pocket Fax/Modem plugs into the nine-pin serial port of a laptop, notebook, or desktop computer and is bundled with MagicSoft's MTEZ with ExpressFax, an integrated fax and data communications software package. A built-in speaker lets you listen to your connections and monitor calls. A carrying pouch, a detachable phone cable, an AC adapter, and batteries are included. An optional Auto-Sync capability provides simulation of synchronous connections.

Price: $799.

Contact: Megahertz Corp., 4505 South Wasatch Blvd., Salt Lake City, UT 84124, (800) 527-8677 or (801) 272-6000; fax (801) 272-6077.

Circle 1292 on Inquiry Card.



The V.32 Pocket Fax/Modem goes well with laptops.

Easy Faxing on Your Network

Advanced EZ-Fax for Networks 3.53, a 9600-bps LAN fax card with LAN fax server and workstation software, is Hewlett-Packard LaserJet and Windows 3.0 compatible. You create and transmit faxes from within any DOS application just as if you were creating and printing a document. EZ-Fax intercepts the print job and transmits the document as a laser-quality fax. The fax card is certified for use with NetWare and LANtastic networks.

Version 3.53 has several new features. Client notification of transmit status lets the EZ-Fax server pass a message back to the sending client notifying of the transmission status. The accelerated HP laser graphics feature, G3F FaxMerge Tag, supports full-page inclusion of fax file documents without requiring conversion to process the documents, thus decreasing the time it takes to ready a fax for transmission. Advanced EZ-Fax fonts are stored in 200-dpi resolution.

Price: AVS96, for up to eight stations, $1399; AVL96, unlimited stations, $1799.

Contact: Calculus, Inc., 1761 West Hillsboro Blvd., Suite 404, Deerfield Beach, FL 33442, (305) 481-2334; fax (305) 481-1866.

Circle 1293 on Inquiry Card.

SunNet Manager Meets AppleTalk

An extension to SunNet Manager Software, Apple AgentMan from Information Presentation Technologies puts AppleTalk devices under the purview of the networking software. Two basic categories of functionality are provided by Apple AgentMan.

The discovery function automatically locates all AppleTalk devices on your network. It collects information about each device (e.g., the device type, name, and AppleTalk socket the device is on) and information such as AppleTalk zone name and network number for each network segment. Apple AgentMan then gives you a detailed report that instantly updates the SunNet Manager database.

Apple AgentMan's proxy agents report and send alarms when network conditions change. Corresponding to SunNet Manager's agents, these agents collect statistics to analyze network performance and the status of specific devices.

Price: $595.

Contact: Information Presentation Technologies, Inc., 555 Chorro St., San Luis Obispo, CA 93405, (800) 233-9993 or (805) 541-3000; fax (805) 541-3037.

Circle 1294 on Inquiry Card.

Intelligent Hub Focuses on Reliability

The Focus Series intelligent hub line uses up to four token-ring hub modules and one network management module in a five-slot chassis in a peer-to-peer arrangement. This setup lets the hub modules function even when the management module is not operating.

Distributed recovery intelligence on each token-ring hub module consists of dedicated hardware and software that detects and automatically removes any faulty nodes attached to that module. When searching for an error, all hub modules search throughout the network in parallel. Other dedicated hardware on each module provides intelligent jitter cancellation, which removes any accumulated jitter of any frequency on the network. This approach lets you mix any combination of untwisted-pair, shielded-twisted-pair, and fiber-optic wiring on your network.

Additionally, each token-ring lobe port incorporates retiming via its own custom VLSI phase-locked-loop chip, providing a dedicated phase-locked loop. Each token-ring hub module supports as many as 20 users.

Price: Starts at $2500.

Contact: Star-Tek, Inc., 71 Lyman St., Northborough, MA 01532, (800) 225-8528 or (508) 393-9393; fax (508) 393-6934.

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intel inside

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ZENITH DATA SYSTEMS

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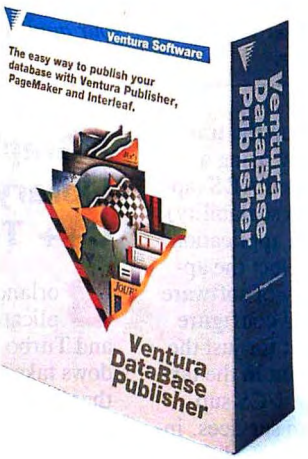
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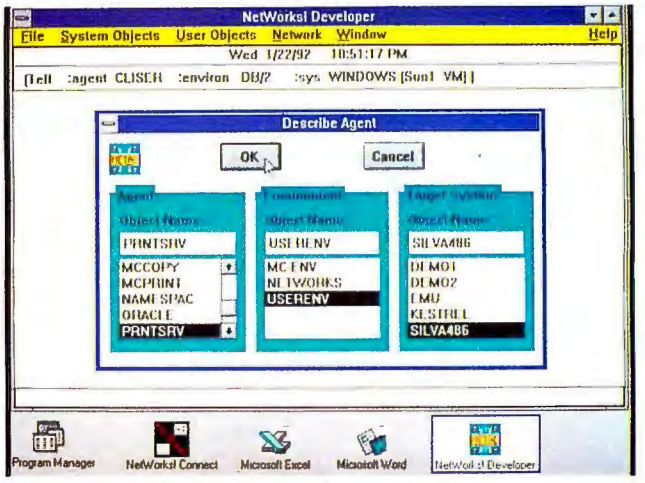
Make Your Applications Network-Savvy

Programmers developing Windows, DOS, or Unix software now have a single tool to add network capability to applications: ND (NetWorks Developer). ND lets you write network software using a common API. Regardless of your platform, the programmatic interfaces to the NetWorks transport system are the same. The system includes agents for creating peer-to-peer and client/server support. You can use ND with most C, Pascal, or COBOL programming tools.

ND's developer also offers a Windows DDE utility for use over networks. According to Symbiotics, Networks Connect extends the hot-linking functions available in Windows, allowing automatic hot links to exist over any PC network.
Price: ND, $2495; Networks Connect, $595 for two-node version.
Contact: Symbiotics, Inc., 725 Concord Ave., Cambridge, MA 02138, (617) 876-3635; fax (617) 876-0157.
Circle 1311 on Inquiry Card.

No-Compromise Cross-Platform Development

Using recompilable master source code and families of reusable software modules, the Universal Component System offers true platform independence to software programmers. According to its developer, UCS lets you build applications for one platform and port them to other platforms without reprogramming and without losing speed or functionality.



The ND agents let you interface your application to the ND translation layer.

UCS speeds up the translation process by using a technology called ADS (application-driven scalability). As you build an application, ADS lets you select the appropriate family of software components and configure each component for just the features you want in the target application. UCS supports all system services, including run-time modules and dynamic linking, not just interfaces. You can incorporate features available on only selected platforms, such as DLLs, into all your target applications.

The UCS API can accommodate evolving architectures such as pen-based and 32-bit. UCS is currently available in Windows and Macintosh editions, with Unix versions in the works.
Price: Depends on configuration.
Contact: Software Transformation, Inc., 1601 Saratoga-Sunnyvale Rd., Suite 100, Cupertino, CA 95014, (408) 973-8081, ext. 700; fax (408) 973-0989.
Circle 1312 on Inquiry Card.

A Graphics Library for C++ Tools

Borland C++ with Application Frameworks and Turbo C++ for Windows take on new power, thanks to The Whitewater Group's OGC (ObjectGraphics for C++). OGC is an object-oriented graphics library that lets you use the Borland tools to create platform-independent support for graphics. OGC masks the graphics engine within Windows and lets you create and manipulate tool objects such as pens and brushes to control the appearance of graphics images. OGC is an extension of the ObjectWindows class library included in C++ with Application Frameworks and Turbo C++ for Windows. Application code developed under one environment is fully portable to any environment where OGC is available.
Price: $195; with source code, $390.
Contact: The Whitewater Group, 1800 Ridge Ave., Evanston, IL 60201, (708) 328-3800; fax (708) 328-9386.
Circle 1313 on Inquiry Card.

Reuse Your Windows and OS/2 Objects

With VZ Programmer, developers of C and C++ applications can reuse software components in building programs. Version 2.1 of the programming tool features a GUI toolkit. VZ Programmer's component library is an extensible set of compound objects that let you group multiple application or GUI objects into a single component. The VZ Programmer tool lets developers of either Windows or OS/2 applications build cross-platform compatibility into their programs.
Price: Windows version, $595; OS/2 version, $995.
Contact: VZ Corp., 175 South Main St., Suite 1550, P.O. Box 3683, Salt Lake City, UT 84110, (801) 595-1352; fax (801) 328-4404.
Circle 1314 on Inquiry Card.

Build Rule-Based Systems Automatically

Aimed at C and C++ programmers who need to integrate rule-based systems into their software, Knowledge Shop 2.0 offers a host of development tools designed to reduce the complexities of such programs. DOS-based Knowledge Shop lets you construct a model of the problem via node linking. You can incorporate defining rules within that model and then generate source code.
Price: $495.
Contact: Decision System Software, 160 West St., Cromwell, CT 06416, (203) 632-7570; fax (203) 635-3839.
Circle 1315 on Inquiry Card.

GO FIGURE!



DesignCAD 2D. Like Leonardo da Vinci's concept of a rotary blade aircraft, it is ahead of its time, not only in technology, but also in cost and value.

DesignCAD 2D is only $349, and it has more and better features than the other CAD programs that cost $3,000!

And, if you're ready for a three dimensional CAD program, there is the state-of-the-art DesignCAD 3D . . . for only $499!

So, how come theirs costs several thousand dollars and ours costs a couple hundred? Go figure. (Why do you think the Mona Lisa is smiling like that?)

Computer Shopper Best Buy of 1991
CAD/CAM Software

PC MAGAZINE EDITORS' CHOICE

PC MAGAZINE EDITORS' CHOICE

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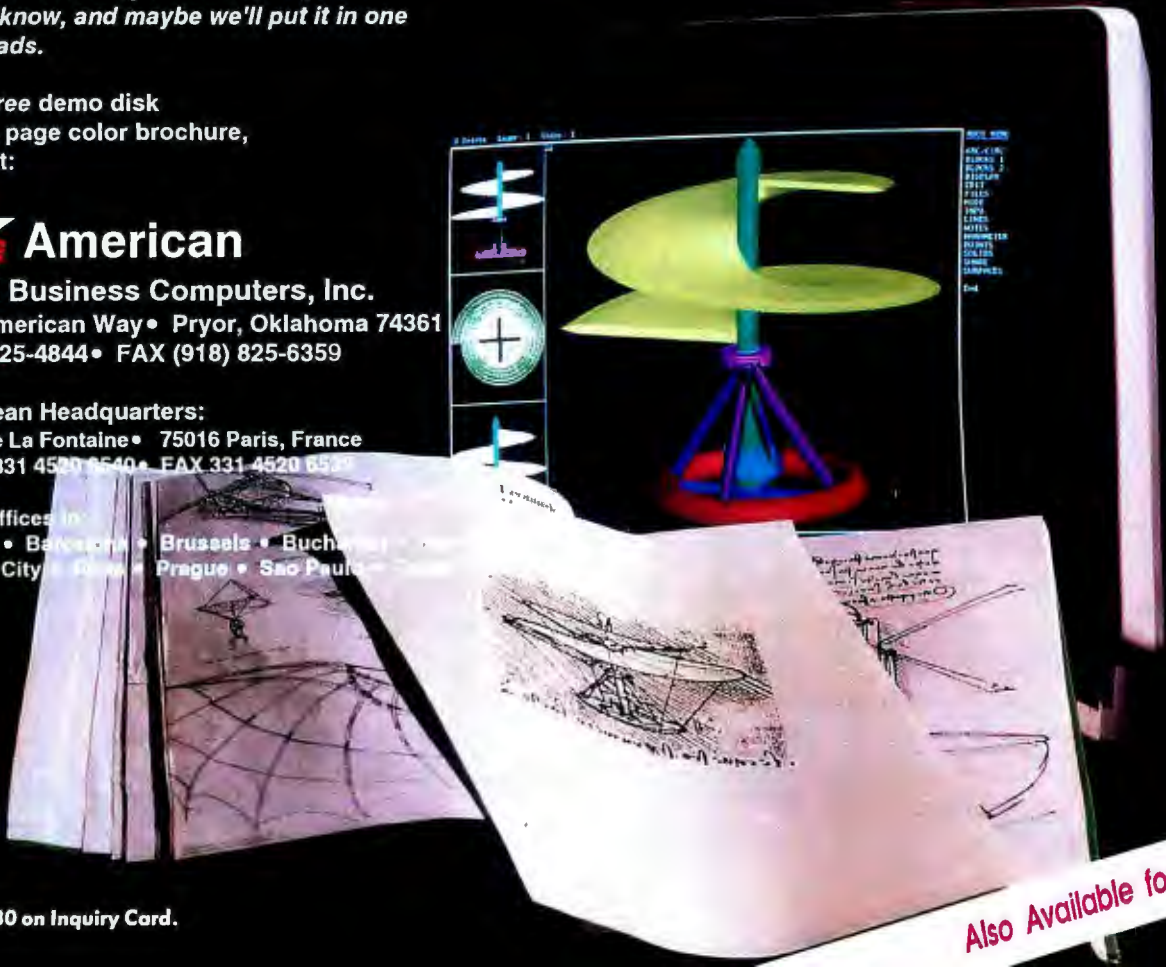
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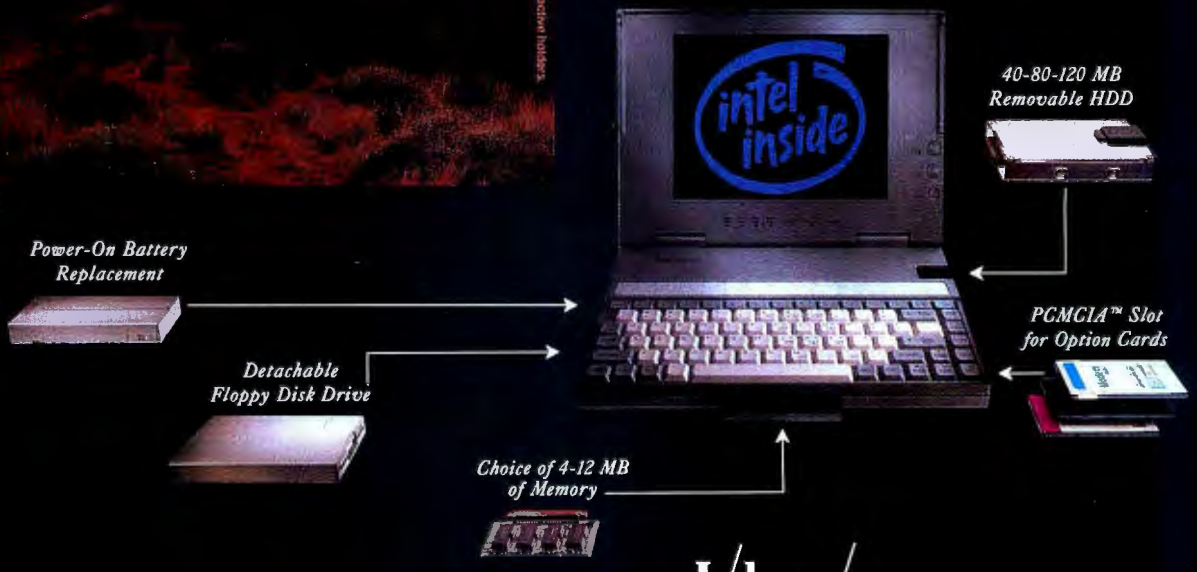
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Quattro Pro Turns 4.0

NetWare awareness, greater support for Lotus 1-2-3 files, and click-bang access to often-used tasks are just a few of the goodies offered in version 4.0 of Quattro Pro, the DOS spreadsheet from Borland.

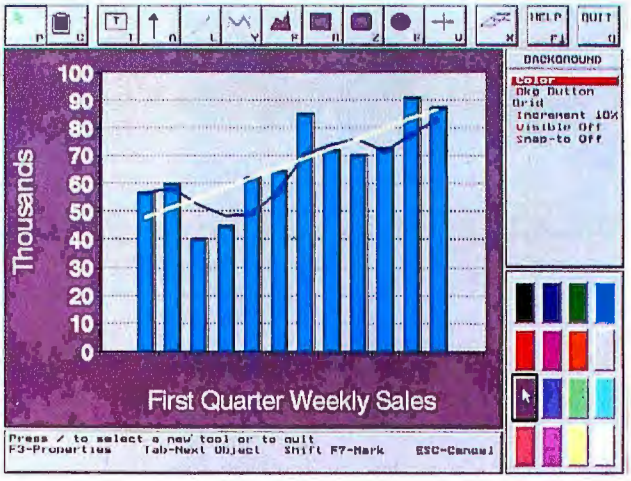
The Intelligent Graphs feature performs one-step statistical analysis and data graphing. The Optimizer, a new multivariate solver, lets you specify a goal in a spreadsheet model, and the solver will then change variables until the specified goal is reached. The customizable SpeedBar provides fast access to commonly used functions, macros, and commands.

NetWare operations can be performed directly from within Quattro Pro 4.0, including automatic log-in and drive mapping. If you need to access a spreadsheet on the server, you can click on the file's icon to retrieve it. The program's Audit tool performs spreadsheet structure analysis and illustrates relationships between cells. Rounding out the upgrade's list of improvements are background printing through a new print manager, the use of Bitstream Font Scaling Technology, and the ability to import Impress, Lotus 1-2-3 WYSIWYG (.FMT and .FM3), and Allways files.

Price: $495.

Contact: Borland International, 1800 Green Hills Rd., Scotts Valley, CA 95067, (800) 331-0877 or (408) 438-8400; fax (408) 439-9119.

Circle 1316 on Inquiry Card.



Quattro Pro's Intelligent Graphs feature performs statistical analysis on spreadsheet data and graphs the analysis without changing the underlying data. You can establish a live link between the spreadsheet and the graph.

Small Business Accounting for Nonaccountants

QuickBooks is an accounting solution for small-business owners who want to spend their time running their business, not learning accounting. According to Intuit, DOS users can use this program without knowing double-entry accounting. QuickBooks manages accounts receivable and payable and produces checks, invoices, and reports for businesses with fewer than 20 employees and under $5 million in yearly sales.

QuickBooks monitors accounting information as it is generated by activities such as billing and check writing. Productivity features include credit-limit warning, transaction history reports, employee sales tracking, and automatic setup of different styles of business-related accounts (e.g., nonprofit).

Price: $139.95.

Contact: Intuit, 155 Linfield Ave., P.O. Box 3014, Menlo Park, CA 94026, (800) 624-8742 or (415) 322-0573; fax (415) 329-2785.

Circle 1317 on Inquiry Card.

A Financial Calculator for PenPoint

In conjunction with the recent shipment of Go Corp.'s PenPoint operating system, PenStuff has released a financial calculator for use on pen-based PCs.

The PenStuff RPN12C+ calculator performs simple and compound interest calculations, amortization, statistics, reverse Polish notation data entry, and other financial functions. Using PenPoint's embedded results feature, you cut RPN12C+ data and paste it into other applications.

Price: $59.

Contact: PenStuff, Inc., P.O. Box 18372, Rochester, NY 14618, (716) 461-3182; fax (716) 256-6236.

Circle 1318 on Inquiry Card.

Put an End to the Debtor's Blues

Blueprint 3.0 analyzes your income, fixed and variable expenses, and debt information and designs a budget covering everything you spend money on, from fast food to postage stamps to your mortgage. The system requires that you keep track of everything you spend in a checkbook-like register. Future versions of Blueprint will provide an online check register and check-writing capabilities.

Built into your monthly budget is a "roll-down" payment schedule to eliminate debts in the shortest amount of time possible. Roll-down means that as soon as you pay off one debt, you must apply its payment to another debt. By eliminating debts in this way, you can avoid huge amounts of interest payments. According to the company, it is possible to pay off long-term debts, such as a 30-year mortgage, in less than a third of the time originally scheduled for payment.

By setting up a budget that meets your particular needs, you don't lose anything. You can still use your credit cards to make purchases, but by following your plan and eliminating your debt early, you can start investing your money and planning for retirement.

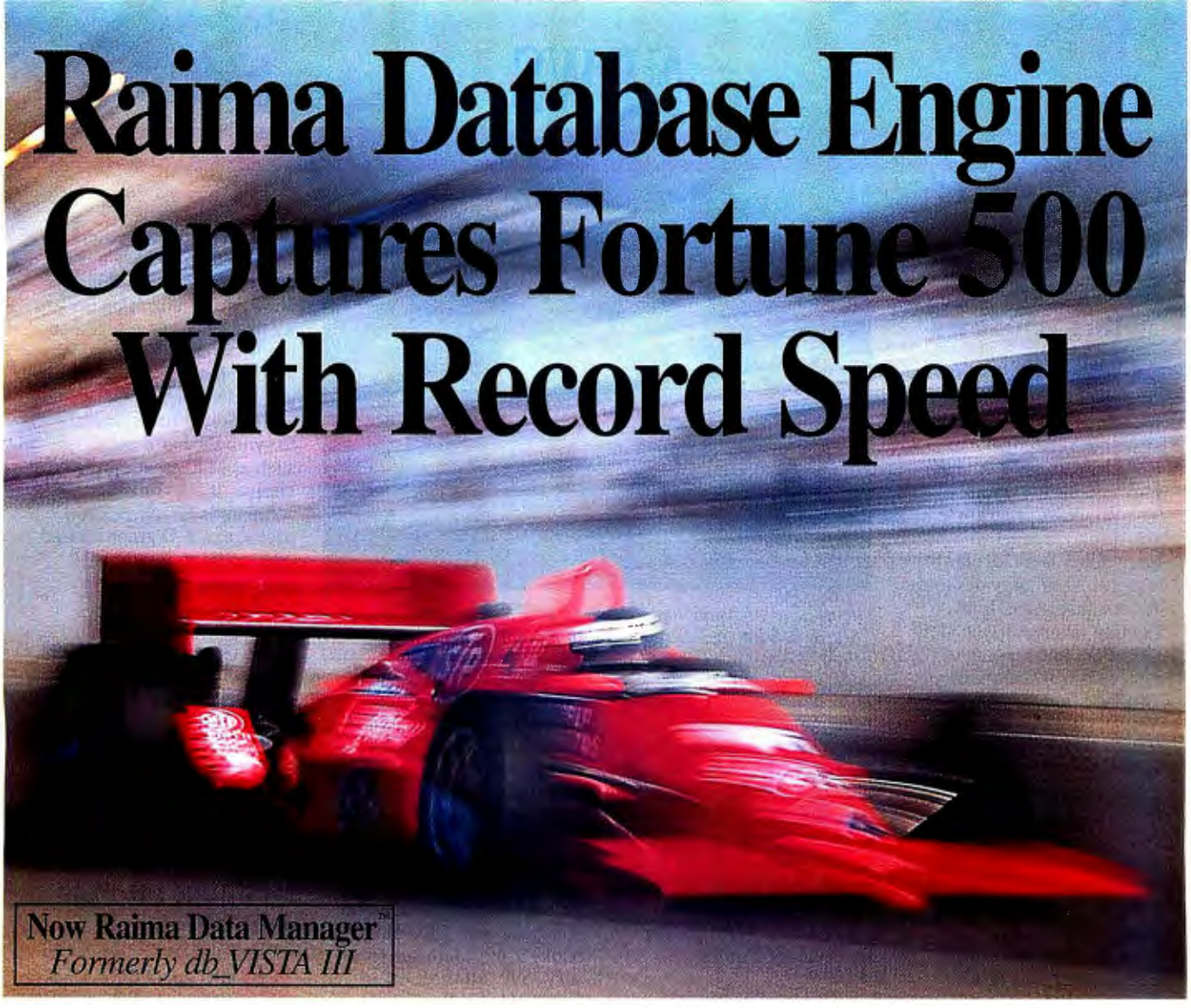
Motivation is a major factor behind Blueprint's success. Reports on current debt status and your eliminated debt show you what you'll avoid paying in interest—true debt—if you stick to your budget.

Price: $149.95.

Contact: Financial Freedom Enterprises, 132 North Woodruff, Suite B, Idaho Falls, ID 83401, (800) 669-8815 or (208) 529-2111; fax (208) 529-0680.

Circle 1319 on Inquiry Card.

Raima Database Engine Captures Fortune 500 With Record Speed



Accelerated Database Performance

Compared to conventional relational databases, retrieval of records can be 10—20—even 50 times faster with Raima Data Manager from Raima Corporation.

Propelling The Biggest Names In Business

Companies like General Motors, Hewlett-Packard, IBM, Eastman Kodak, Rockwell and others are using Raima Data Manager in their competitive environments. Today's most critical, most demanding applications demand the high performance of Raima Data Manager.

Powerfully Efficient Leading-Edge Technology

Raima's combined technology merges the flexibility of relational databases with the lightning speed and efficient storage of the network model. With the program written entirely in C, you can "fine-tune" the Raima Data Manager engine for optimum performance in any application.

Put Yourself In Fast Company

Give yourself the competitive edge of Raima Data Manager:

- Speed—faster access to data
- Portability—supports most environments
- Royalty-free—increase your profits
- Source code availability—total programming flexibility
- Full Raima support services—including training

Whether you're writing a stand-alone DOS application, or one for UNIX accessing thousands of records, Raima Data Manager will put your application on the fast track. Race to the phone and call for more information!

Raima Data Manager™
The High Performance DBMS

In the U.S. or Canada, call: 1-800-DB-RAIMA
In Washington state or international, call: **(206)747-5570**

Specifications Relational B-tree indexing. Network data model. Relational SQL query and report writer. Single & multi-user. Automatic recovery. Built-in referential integrity. **Supports:** VMS, QNX, ULTRIX, UNIX System V, Berkeley 4.2, AIX, SunOS, SCO, MS DOS, MS Windows, and OS/2. **Most C Compilers and LANs supported.**

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Circle 149 on Inquiry Card.

Model Chemical Molecules Within Windows

Designed specifically for the research scientist, chemVision converts structured chemical data (i.e., numeric coordinates) into editable 3-D models. The Windows program lets you display, render, move, and scale 3-D molecular structures and provides tools for magnification, highlighting, characteristic identification, and tagging of molecular substructures.

In addition to chemVision's visualization capabilities, you can use the product to produce presentation-quality output. According to the developer, chemVision supports all Windows-compatible printers and plotters, including PostScript devices.

Price: $299.

Contact: Molecular Arts Corp., 1532 East Katella Ave., Anaheim, CA 92805, (714) 634-8100; fax (714) 634-1999.

Circle 1320 on Inquiry Card.

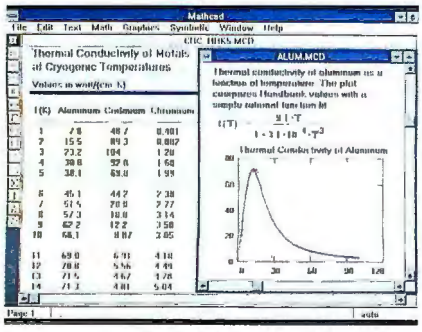


chemVision turns the numeric structural formula for Dibenzo-18-crown-6 into a 3-D representation of the molecule.

Mathcad 3.1 Puts Handbooks On-Line

Mathcad 3.1 for Windows turns two engineering industry bibles into live, interactive resources. Machine Design and Analysis from the *Standard Handbook of Engineering Calculation* and *The CRC Materials Science and Engineering Handbook* are available on-line within the Mathcad upgrade. You can take equations, formulas, and diagrams from the handbooks, drop them into your document, and solve or change them within either the handbook or the document.

Machine Design and Analysis offers access to more than 125 calculation procedures, including shaft torque, horsepower, and speeds of gears. The CRC Handbook provides more than 140 tables, illustrations, and Mathcad plots. Included in the CRC Handbook are densities, melting points, and hardness and resistivities of ceramics and polymers. Also available on-line is MathSoft's guide to Mathcad, the Treasury of Methods and Formulas.



Using data provided by the CRC Handbook, you can determine the thermal conductivity of aluminum, graph it against the temperature, and use the resulting graph in your own document.

Mathcad 3.1 features OLE (Object Linking and Embedding) client status, color surface plotting, and user-definable grid lines. MathSoft will also offer Macintosh and Unix versions of the on-line handbooks.

Price: Machine Design and Analysis, $99; CRC Handbook, $149; Mathcad Treasury, $99; all three on CD-ROM, $199.

Contact: MathSoft, Inc., 201 Broadway, Cambridge, MA 02139, (617) 577-1017; fax (617) 577-8829.

Circle 1321 on Inquiry Card.

Graph and Present Your DOS Equations

TK Solver now offers presentation-quality reporting and user-programmable macros. Release 2.0 of the DOS program consists of a bundled library of tools for solving such problems as differential equations, statistical analysis, and algorithms. TK Solver lets you plug in known elements of an equation, and the program fills in the missing pieces (i.e., performs back solving).

Like its predecessor, TK Solver 2.0 has a graphing capability that provides graphical representations of your equations. New to the program is Presentation View, an organization utility that lets you put together reports containing multiple sheets of equations, graphs, and text.

TK Solver links directly to symbolic math packages such as Mathematica and Derive. It also links to the company's Graphics 2000 package, a 3-D graphing and annotation program that has image-manipulation capabilities.

Price: TK Solver 2.0, $595; Graphics 2000, $395.

Contact: Universal Technical Systems, Inc., 1220 Rock St., Rockford, IL 61101, (800) 435-7887 or (815) 963-2220.

Circle 1322 on Inquiry Card.

Equation Building for Mac and Windows

MathType 3.0 for Macintosh and Windows lets you build (but not solve) equations and merge them into word processing, desktop publishing, and other documents. Windows users will find that the upgrade provides support for OLE (Object Linking and Embedding), PostScript Type 1 fonts, and TrueType fonts. The Mac version also supports OLE and offers System 7.0 compliance, too. MathType 3.0 offers both Mac and Windows users a toolbar for storing frequently used equations and templates, a font/symbol storage facility, and the ability to save equations as EPS files.

Price: $199.

Contact: Design Science, 4028 Broadway, Long Beach, CA 90803, (800) 827-0685 or (310) 433-0685; fax (310) 433-6969.

Circle 1323 on Inquiry Card.


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FOR ANYONE TIRED OF TAKING IT
ON THE CHIN



Desktop Direct™ from Digital™

Today's economy is tough. That's why Desktop Direct from Digital is determined to keep performance peak. Prices down. And service unparalleled.

So now there's no reason to take a dive when it comes to buying a notebook computer. Digital's 6.4 lb. DECpc™ 320P Notebook lets you float like a butterfly at a price—$1,995—that doesn't sting like a bee.



A 6.4 lb. featherweight that packs a 20 MHz punch.

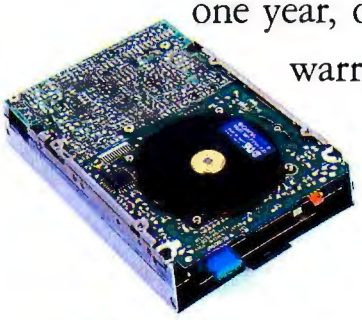
With an i386sx, 20MHz processor, 2MB of memory (expandable to 8MB) and a 40MB (optional 80MB) hard drive, the 320P Notebook packs all the punch of much larger PCs. So you can use your fancy footwork far from your office—without sacrificing computing power. And because the 320P Notebook comes preloaded with DOS 5.0

example: all components—including the video and memory—are installed on the main logic board. That means better performance without higher prices.

What's more, the 420sx is always ready to step up to a real heavyweight challenge. Its standard 4MB of memory is expandable to 32MB, and an 8KB memory cache is constantly jabbing away. Storage options include 52MB, 105MB and 120MB IDE hard drives and 209MB and 426MB SCSI hard drives. That's just the bulk you need to step into the ring with the big guys. And of course, the 420sx comes preloaded with DOS 5.0 and Windows 3.0—so you're ready for a workout right away.



As with all Desktop Direct products, the 420sx is backed by our 30-day money back guarantee and our one year, on-site, no fine print warranty—at no extra charge. So you can rest assured that no matter how tough your challenge, the world's second largest computer company is always in your corner.



52MB, 105MB, or 120MB hard drive gives you plenty of storage muscle.

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Your Telephone No. _____ Your FAX No. _____

I'd like information on:

- ☐ DECpc i386 and i386sx based systems
- ☐ DECpc i486 and i486sx based systems
- ☐ The DECpc 320P Notebook
- ☐ The Catalog

ANB

Customization Worksheet

Your base system is a: ☐ 286 ☐ 386 ☐ 486 ☐ Other

How many applications will your PC(s) run in a typical workday?_____

What best describes the type of work the system will be used for?
(Check all that apply)

☐ Word Processing	☐ Desktop Publishing	☐ Scientific Research
☐ Order-entry	☐ Education	☐ Software Development
☐ Database (filing records)	☐ Design (CAD/CAM)	☐ E-Mail
☐ Financial Calculations	☐ Engineering	☐ Other industry-specific applications (please specify)
☐ Retail Store Management	☐ Industrial Process Control	

How many people work in your group, department or small business?
☐ Less than 10 ☐ 10-20 ☐ 20-35 ☐ More

Is your operating system:
☐ DOS ☐ DOS with Windows ☐ OS/2 ☐ MAC ☐ UNIX™ ☐ Other

Which of the following graphics-oriented applications best describes your needs?
(Check all that apply)

☐ Desktop Publishing	☐ Realtime Modeling	☐ AutoCad
☐ CAD/CAM	☐ Animation	☐ Business Graphics
	☐ Image Processing	

LAN Communication

How many PCs do you have installed?_____ From how many manufacturers?_____
What kinds of connections does your PC(s) require? (Check all that apply)
- ☐ Links with other PCs in the immediate surroundings
- ☐ Connection to the local area network (LAN) throughout a building
- ☐ A line to a host system in a remote location

What kind of media (cable) is used in your LANs today?_____
What is the networking software now being used in your company?_____
What kind of host system will your PC communicate with?
☐ DECpc ☐ IBM ☐ Other_____

What Kind of Service Do You Really Need?

☐ On-site Hardware Support ☐ Software Support ☐ Telephone Support
☐ Training ☐ FAX Hotline

How many of your users take portables on the road?_____
Do you currently have a service contract(s) for your PCs? How many?_____

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The DECpc 420sx



Every i486-based system to come along stakes a claim to the heavyweight PC title. But as the saying goes, the bigger they are, the harder they fall.

That's why Desktop Direct from Digital built a 20MHz i486sx system that's lean enough to be affordable (at $2,399) and mean enough to deliver a knockout blow.

Besides support for 32MB memory, the 420sx packs a punch that hits you right between the eyes: state-of-the art, non-interlaced video technology for 1024 x 768, 256 color graphics.

And because Digital's engineers are always in training, they designed the 420sx to have every possible competitive edge in PC prizefighting. One

TECHNICAL



The **DEC**pc 320P Notebook

Includes:

Microprocessor:	Intel i386sx running at 20MHz
Memory:	2MB
Storage:	40MB IDE Hard Disk Drive 3.5" 1.44MB Floppy
Display:	TST Backlit VGA
Modem:	2400 bps Data
Keyboard:	84-key
Mouse:	Logitech™ TrackMan® Portable
Operating Systems:	MS-DOS 5.0 and MS-Windows 3.0 (factory installed)

(Carrying case included)

Special Package Price **$1,995**

FR-PCP11-AA

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NEW LOW PRICE



The **DEC**pc 316sx

Includes:

Microprocessor:	Intel i386sx running at 16MHz
Memory:	2MB, 80ns Memory Kit
Storage:	52MB IDE Hard Disk Drive 3.5" 1.44MB Floppy
Resolution Mode:	1024 X 768 SVGA Adapter
Display:	14" Multi-sync VGA Color Monitor
Keyboard:	101-key
Mouse:	Three-button
Operating Systems:	MS-DOS 5.0 and MS-Windows 3.0

Special Package Price **$1,799**

DJ-PC444-06

DESKTOP DIRECT 48 HOUR TURNAROUND

NEW LOW PRICE



The **DEC**pc 420sx

Includes:

Microprocessor:	Intel i486sx running at 20MHz
Memory:	4MB expandable to 32MB on main logic board
Storage:	105MB IDE Hard Disk Drive 3.5" 1.44MB Floppy
Video Adapter:	1024 X 768 VGA with 512KB of video RAM upgradeable to 1MB to support 256 colors
Display:	14" Multi-sync VGA Color Monitor
Keyboard:	101-key
Mouse:	Three-button
Operating Systems:	MS-DOS 5.0 and MS-Windows 3.0

Special Package Price **$2,399***

DJ-PC445-09

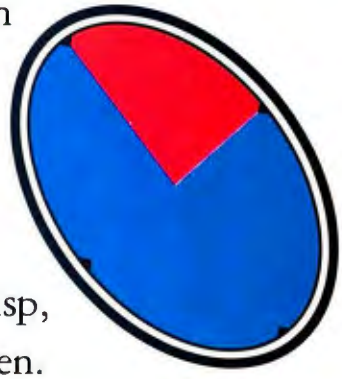
DESKTOP DIRECT 48 HOUR TURNAROUND

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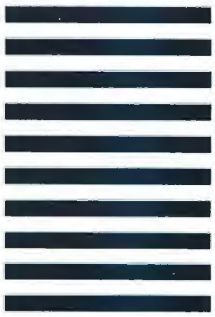
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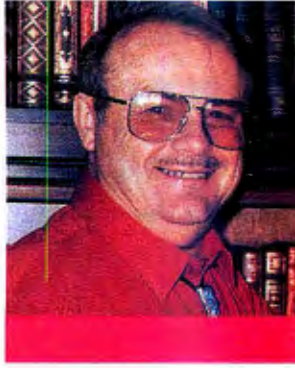
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JERRY POURNELLE

THE MAC GOES TO SCHOOL

For the last six weeks, I have had three different strains of flu, and for a while I wondered if I'd ever feel good again. The frustrating part would be sitting down to work. Hours would go by, and I'd produce a dozen lines. I would shout, "I'm trying to think and nothing happens!" in hopes of making a joke of it, but there was a lot of truth to that, and it was a frightening experience.

Then a week ago, suddenly all was well.

The big news is that Larry Niven and I have finished *The Moat Around God's Eye* and shipped it off to our agent. If that weren't enough to rejoice over, I managed to get something done for the Smithsonian and start a new novelette; and of course I'm getting this column out. It's great to be back.

The Productivity Paradox

There are 100 million small computers in the U.S., but efficiency experts claim they've had little or no effect on productivity, and the experts are puzzled. They needn't be. What happened is that small computers made it possible to comply with more government regulations and bureaucratic red tape. Since that kind of work always expands to fill the available capacity to do it, we ended up with an ever-increasing stream of new regulations.

Worse, computers make it easier for the government to force compliance. We have plenty of new productivity: you just don't see it, because it's been absorbed in regulations and compliance documents.

The Macintosh Story

When the Macintosh first came out I thought it was unfinished. The operating-system concept was excellent. I had a Lilith, a machine conceived by Niklaus Wirth, when I first saw the Mac's very slow predecessor (called Lisa), so I was already familiar with the operating-system principles. The Mac, like the Lilith, was a giant step forward in usability over CP/M and its DOS followers. Unfortunately, this potentially winning operating system was attached to a toy computer. There wasn't enough memory, it was prone to overheating, and the 68000 chip was badly overworked in its triple duties as drive controller, screen manager, and CPU.

Worse, we were told that the 128-KB Mac was all there ever would be; Steve Jobs was adamant in insisting that this was good enough. Developers could safely write for this Mac, as there would be no upgrade.

Of course, no one believed him. It was just too obvious that the 128-KB Mac was inadequate. Eventually there came a bewildering series of upgrades, some of which appeared only to soon vanish. There was also a long series of software improvements, culminating in System 7.0.

My early observations about the 128-KB Mac gave many people the impression that I didn't like the Mac at all. This was spurred on by the fanatic loyalty of some of the early 128-KB Mac users. (I suspect they knew better, but having paid so much for the machine, they had no choice but to defend it.) The truth is, though, I bought a 128-KB Mac and acquired every Mac upgrade, from the first Mac to the "Fat Mac" (with an internal 5-MB hard drive and more memory), on through different stages to the Plus. I used that machine to do my taxes every year. More important, that early Mac has always been available to my children. The youngest one, Richard, pretty well grew up with it.

Jerry makes recommendations on computers for the college crowd



The legend is that the cobbler's children go barefoot. But when Richard enrolled at UCLA, I wanted him to have a decent computer. He had for years had both Mac and PC machines available, and he knew what he wanted. He wanted a Mac, but preferably not my original 128-KB system with all its upgrades. He would have liked one of the new Mac II machines, but it didn't look to me as if he'd need that. After some thought, we decided on a Mac Classic II.

He's been using that for about a year now, and I can confidently say that a Mac Classic II is an excellent choice for high school and liberal arts college students. Engineering and science majors will probably want something fancier, but the Mac Classic II is a lot of machine for the money.

Outfitting Your Mac

Alas, the Mac Classic II isn't very useful as it comes out of the box; neither is the top-of-the-line Quadra, for that

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matter. For reasons I've never understood, Apple ships these machines woefully deficient of memory. The Classic II has barely enough memory to run System 7.0; if you want it to do anything useful, you must turn off features and use tricks. This implies a computer sophistication a great deal higher than most college students have. Apple has put out some free software that helps, but it's still a kludge; it's better to add memory.

Fortunately, adding memory is simple and not very costly. Ours came from Technology Works. When the first 2-MB package of memory arrived, we thought we'd put it in the Quadra, because Roberta kept having memory-limit problems. That turned out to be impossible: the Quadra will accept memory only in 4-MB blocks.

Technology Works memory comes with complete instructions for installation in just about any Mac, including the Classic II. Now, while my oldest son Alex is a typical computer techno-weenie, his youngest brother most decidedly is not. Richard is the debate team captain and will do well in whatever scholarly profession he chooses—but a computer techie he is not. It was thus with some trepidation that I handed him the memory package. But it all worked out well. He says, "All the small Macs always have been a pain to open up and install stuff inside." But he had no real trouble. The early Macs used Torx fasteners to make it more difficult to open the case, but the Classic II uses ordinary slotted screws.

Observations by Richard

His most emphatic warning is to confirm that you need additional memory: the Classic II with System 7.0 uses so much memory on start-up that many programs that worked fine on a Mac Plus won't work at all on the Classic II as it comes out of the box. On the other hand, System 7.0 is preinstalled; some previous Mac OS updates were complicated and tedious, but that doesn't apply here.

Richard's second warning: don't use virtual memory. He has found that it won't work with many programs, and you can't print more than a single page on a Hewlett-Packard ink-jet printer with virtual memory turned on. ("It freaks out and prints gibberish.") I'm told that there are upgrades to virtual memory that fix many of the major bugs, but Richard's advice is to buy more memory and leave virtual memory off.

He also notes that the Mac Classic II, unclassically, has a built-in fan; you no longer need one of those external fan devices that sit on top and draw air up through the vent slots. We had one for the Mac Plus, and it needed it, too.

Richard and his roommates have concluded that the HP DeskWriter 2279A is the best buy for a printer, a good compromise between speed and price. No one cares much for the ImageWriter II.

Incidentally, my first Mac printer was the original ImageWriter; it was slow and a bit of a pain to use, as well as noisy. The DeskWriter ink-jet printer is a joy by comparison. The ultimate printing system is a LaserWriter, but Richard and his friends have found that they don't need anything so fancy, and the DeskWriter works just fine for homework, letters, and suchlike. They also have a Seikosha SP-2000AP. It is slow and noisy, but it's very cheap—its street price is under $100—and as Richard says, "It gets the job done, only really slowly."

Students will also need a modem and communications software. Richard has an Intel 14.4EX (14,400 bps, V.42bis, and MNP level 5). That's considerably more modem than a student needs, but I wanted it tested in a harsh environment. We're pleased to say that the Intel modem was easy to install (he only had to buy a cable), and it has worked splendidly. This modem is particularly useful for data transfer when there's a similarly fast modem on the other end.

We don't have a CD-ROM drive on Richard's machine just now, but I think that's a mistake, and we're getting one set up for him. There is a great deal of CD-ROM educational software—enough that it's worth having a CD-ROM drive—and I recommend that you get one when outfitting a student's Mac. Many CD-ROM drives will work with the Mac as well as PCompatible machines; it's important to get the proper CD-ROM software. An easy way to do this is to contact the Bureau of Electronic Publishing (141 New Rd., Parsippany, NJ 07054, (800) 828-4766 or (201) 808-2700; fax (201) 808-2676) and get their catalog; the catalog is a good introduction to the world of CD-ROM for both the PC and the Mac. The Bureau's hardware prices are generally competitive, and their technical support is excellent.

An item that may be worth having is a scanner. Logitech makes a full line of PC and Mac hand-held scanners. Scanners are more useful for students who need to build visual databases than for liberal arts majors. But, coupled with OCR (optical character recognition) software, they can be useful for dragging in material (e.g., text and illustrative diagrams) to be quoted in term papers.

A final hardware item for a Mac would be some reasonable-quality stereo speakers. These plug into the CD-ROM box.

continued

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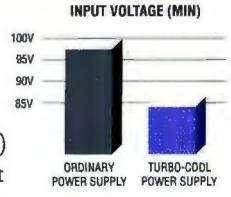
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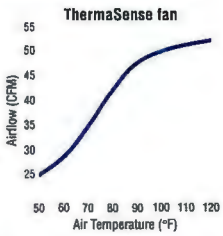
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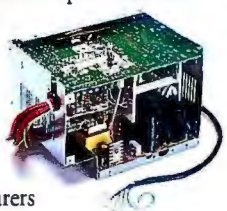
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There's a great deal of music software (see below) and other instructive material available as audio output on CD-ROM. I tend to use Radio Shack speakers; you can get a surprisingly good stereo pair for about $30. You can spend a lot more. Since I'm partly deaf, I am not the person to consult about audio quality.

Where to Get a Mac

The best place for a college student to obtain a Mac is in the college bookstore. At UCLA they will let you buy one (and only one) computer (when you show a student ID) at the educational discount price, which will probably be lower than the prices anywhere else. On the other hand, their prices for software and accessories are high—considerably higher than advertised street prices.

It's wise to shop around. However, some places advertise Macs at what look like low prices, but then you find that's without software or keyboards. When you add it all up, it will be higher than the college bookstore price.

Form Factor

Richard grew up with a Mac, but he really dislikes the small screen and cramped keyboard of what he calls "normal Macs." The Classic II keyboard is much nicer than the original Mac keyboard: the action is better, and the mouse is better constructed. On the other hand, the small size does make for some awkward key placements.

The screen size is even more troublesome. It really is harder to work with the small screen, because it doesn't show as much text as a larger one, and the image of what's there is smaller. This isn't as much of a disadvantage to young eyes as it would be to mine, but I note the beginnings of a campaign to get me to swap Richard's Classic II for a larger-screen Mac II.

Richard thinks the only reason to prefer the smaller Mac is price; he doesn't see any real advantage to the smaller form factor. Students aren't generally cramped for desk space, and, given his druthers, he'd prefer the Mac II with a larger screen.

Software

No matter what a student's major, the primary use of a college Mac will be word processing. There are a million word processors out there, and most of them have good points. Richard had his choice of all of them, and he finds Microsoft Word the most congenial. It has the capability of easy transfer of files to a PCompatible and back to the Mac, which can be useful to those involved in debating or on other team intellectual projects.

Microsoft Word has more features than most will ever need, and it's not inexpensive; on the other hand, it handles footnotes well and makes it easy to insert equations and diagrams into a term paper. Word is often available at deeply discounted prices, and it will be all the word processor you'll ever need.

One step down would be Microsoft Works, which is generally good enough. It also contains a reasonable database and spreadsheet. It makes charts and graphs, and while it won't handle equations and footnotes anywhere near as well as Word does, it sure beats the typewriter I had to do all my homework on. I have never used Works on a Mac, but I have a Windows version that's not bad at all; the only reason I don't use it is that I've gotten used to other word processors, databases, and spreadsheets.

Works' ability to transfer data among the three functions is a very great plus: if things are easy to do, you'll do them more often, and that kind of embellishment can

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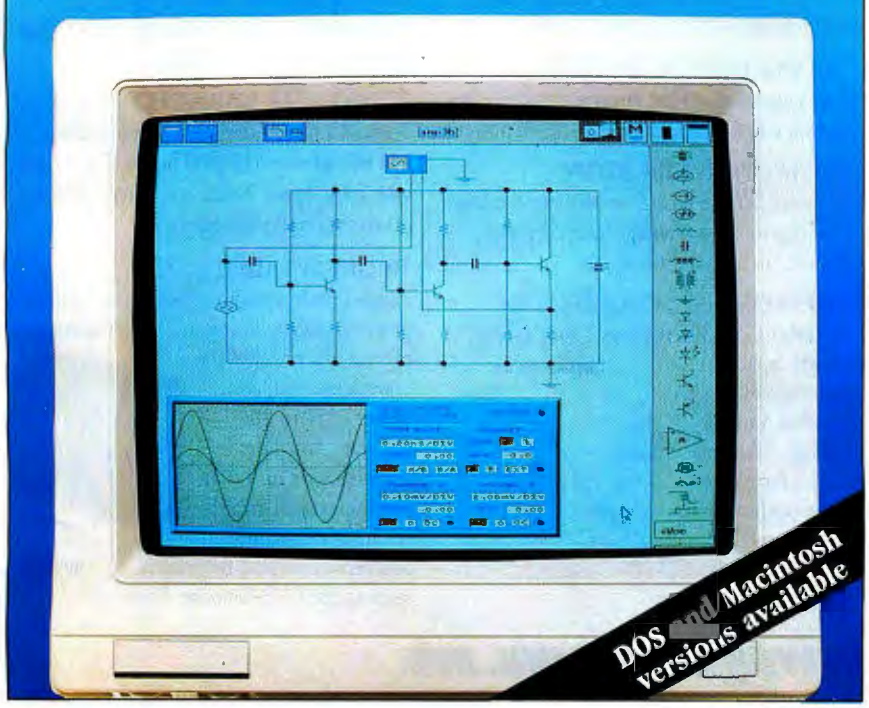
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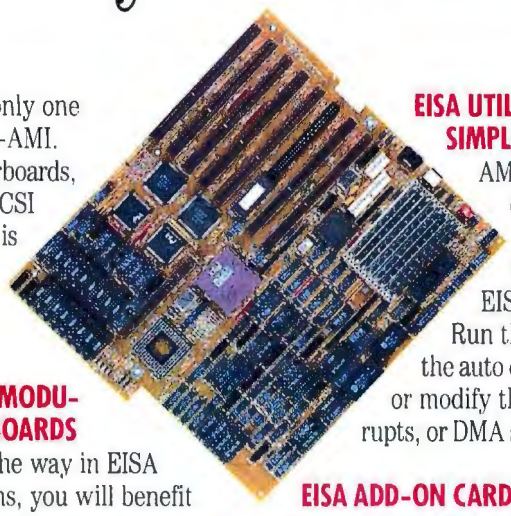
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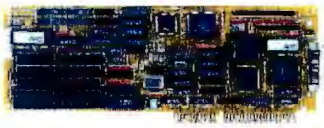
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make for impressive homework and term papers. I have no hesitation in recommending Microsoft Works as a good first program for students. By the time they need more power, they'll have a better idea of what they want.

Grammatik IV

Richard also finds the Grammatik grammar and style checker very useful and believes it has helped his grades. I share that opinion. I don't often use Grammatik on my own work, but as a professional writer, I wouldn't be expected to. However, when I do run Grammatik against my text, it will often call my attention to passages that need work.

I generally don't do what the program says I should, and, indeed, I'm not too fond of the suggestions Grammatik makes; the program is a great deal better at finding problem text than fixing it. Still, it's very much worthwhile to have possible mistakes pointed out before you turn in work, whether it's a column or a term paper.

Microsoft's Schedule+

Windows has calendar and appointment-book software built into the operating environment, but Mac users have to buy one. Richard has found Microsoft's Schedule+ fairly valuable for keeping track of appointments and assignments.

Like the programs I've discussed this far, this is easy to learn. I haven't given Richard any computer lessons in five years, so he has learned to use all these programs on his own, and since he has almost no free time, anything he uses (other than games) must be useful. I know I wish I'd had a good schedule program when I was an undergraduate.

Voyager

One reason to have a Mac and a CD-ROM drive is Voyager's line of Music Appreciation Software. They have programs on Beethoven's Ninth Symphony, Mozart's Dissonant Quartet, and Schubert's *The Trout* Quintet, among others. The Voyager package consists of a good recorded performance of each work, hypertext commentaries giving background information on each composer and his life, detailed running commentaries on the music (including the score) as it's played, and that sort of thing. Warner has done much the same thing with *The Magic Flute*. Both Voyager and Warner publish new titles every few months.

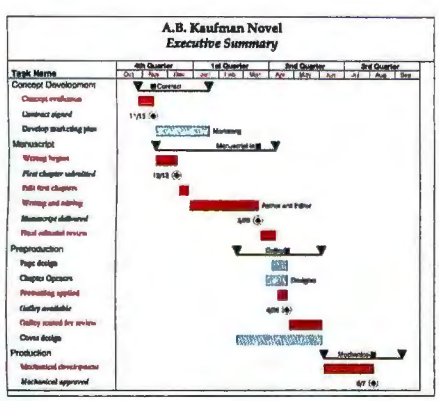
Voyager also has a series of books in hypertext. These don't need a CD-ROM player; indeed, they're adapted to run on a PowerBook portable. I have *The Complete Annotated Alice* and Michael Crichton's best-selling *Jurassic Park*. The notion is that you put the book on your PowerBook and you can read at odd times, just as you would from a book you'd carry. In addition, you get hypertext capabilities that let you jump around for additional information, some illustrations, maps, and definitions (e.g., scientific exposition on dinosaurs).

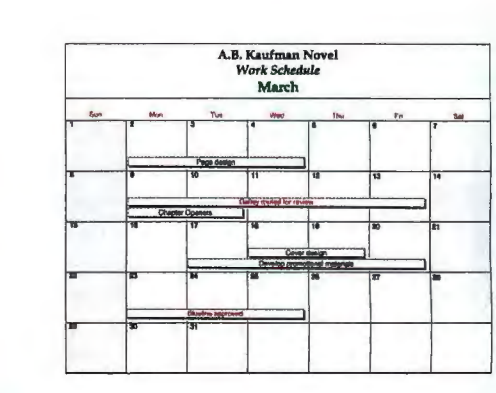
It's an interesting way to read a book. Alas, however, although most Mac software runs on every Mac there is, there are exceptions, and these extended books are one of them. They run only on Macs with 13-inch or larger screens.

Voyager is doing some wonderfully innovative things, much of it inspired by the capabilities of the Mac. Now that Windows is catching on, I expect to see some of the company's software for Windows machines. But for the moment, the Mac line really is ahead of PCompatibles in

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bold new software concepts. (Amiga enthusiasts will point out that the Mac has yet to catch up to their machine; that's a story for another time.)

MacConclusions

The Mac is a good machine for students. Of course, that doesn't mean it's not a good machine for anyone else, but it's a particularly good machine for students, and particularly for students who have had little exposure to computers. The Mac is very easy to learn. I have observed that it takes hard work to get the most out of small computers, and that's as true for a Mac as for any other machine. However, a beginner can get more useful work done *right now* with a Mac than with a PC. Mac software is easier to use, and the Mac interface ensures that once you learn one piece of software, you're well along the way to learning all of them.

Up to now, that hasn't been true in the PC world. Windows is changing that, but it has only just begun that work. Of course, Windows is still only the most popular of a bunch of competing successors to the world of DOS and the uninformative C:> prompt.

I would argue that it takes about the same amount of work to become really proficient at either the Mac or the PC. The difference is that the PC learning curve is fairly steep at the beginning and then levels off at the intermediate stage; the Mac learning curve is more nearly constantly linear, so it takes a lot less effort to get to MacCompetence than to become a junior Power PC User.

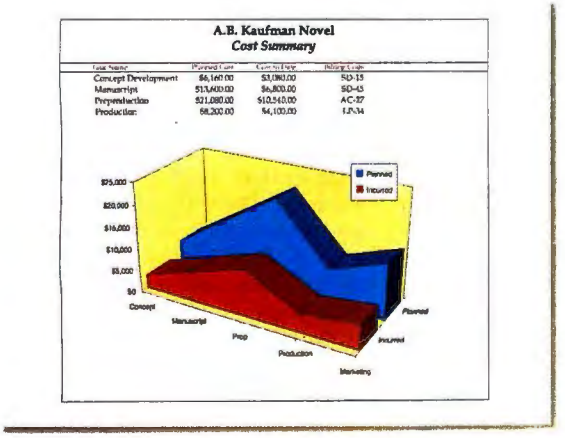
We all know that beginning students have a lot of adjustments to make; learning to use a computer is one of them. It isn't the hardest of those adjustments, but it's nontrivial. Clearly, if a student is already used to a PC, it's probably better to send that student off with something familiar. But for those who have no previous knowledge of a machine, a Mac is a very good choice.

Another advantage to the Mac is that it's easy to add new peripheral equipment to it. When we wanted to upgrade the Quadra so that it sports both a large monochrome screen for page layouts and the normal-size color screen for everything else, we just installed the board and turned on the machine. The operating system understood that there were two screens in place and knew how to handle that. With a PC, we'd have been forever trying to figure out interrupts, address spaces, and other nightmares.

The PS/2 Micro Channel machines aren't quite that brutal when it comes to adding peripherals. With those, you run a program that lets the machine do the work of figuring where things are to be addressed and what interrupts to employ. But, alas, the PS/2 Micro Channel isn't the way the third-party industry is going. IBM seems to have lost their marketing smarts on that one: companies that might well have been willing to pay a licensing fee for the Micro Channel have been scared off by IBM's attempts to use that as a screw to make them pay for cloning the old PC architecture. For whatever reason, not many third parties are developing hot new hardware peripherals for the Micro Channel. A PS/2 is probably not the machine to send off with your kid to college.

There remain expandable PCompatibles, like the new Acer line; I'll get to those in another column. By and large, though, the Mac is a very good machine to send off to college. While most students would prefer either a PowerBook or the

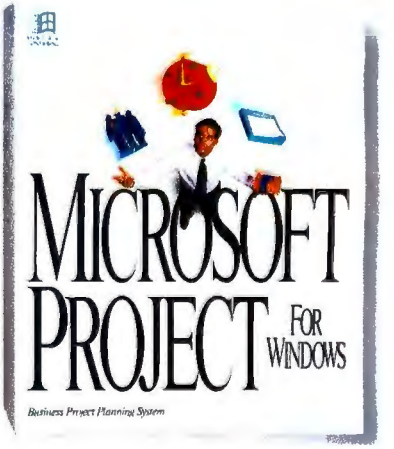
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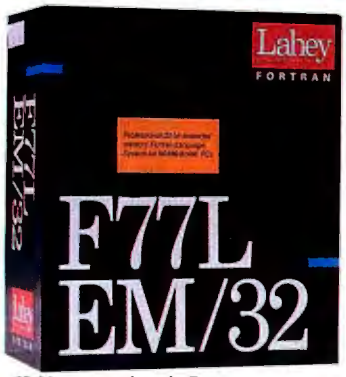
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Mac II for the larger screen size, the Classic II is plenty good enough. I have no qualms about recommending it.

Printout Blues

The Moat Around God's Eye is 767,356 characters (about 128,000 words) long. You'll note that one figure is exact and the other clearly an estimate; a story goes with it.

Moat was written using Symantec's Q&A Write. I use the stand-alone version, while Larry Niven uses the one in the Q&A combination database and word processor package. Let me say at once that we're fond of the program. It has always been the easiest-to-learn word processing program of the lot. It's unobtrusive, putting little on the screen that you don't put there yourself, so the text area is clean and uncluttered. It's a character-based editor, which means you don't get WYSIWYG, but creative writers don't need that.

It's easy to set line lengths and margins, and it has a wonderful word-counting feature. At any time, you can press Control-F3 and up will pop a table showing the number of words, lines, and paragraphs before the cursor, after the cursor, and in the entire document. Since some writing assignments are measured by word count and others are by line count, this is a really useful feature.

Q&A Write has as good a search-and-replace program as any I know. It works nicely with both Definitions Plus (WordScience's electronic version of *The American Heritage Dictionary*) and the Word Finder thesaurus from Microlytics loaded as TSR programs. This means I can, for instance, look up the meaning of *resident*, or find that I could substitute *lessee*, *occupant*, *intern*, or any of a dozen other words at the touch of a key. The Q&A Write spelling checker is pretty good, too. In a word, Q&A Write is more than just good enough for text creation.

Q&A Write is good enough for printing out letters and manuscripts of up to about 50 pages. It's fast, it knows how to use the HP LaserJet III font cartridges, and it allows reasonable headers and page numbers. Alas, it's plain lousy for printing out a book. Once the work gets longer than a single file (only about 50 to 75 printed pages at most), it's a real pain to get it to print with proper headers and page numbers.

There are three different versions of Q&A Write, and every one of them has a serious bug in its printing capability. The infuriating thing is that each version fixes one bug—only to introduce a worse one. The upshot is that while I *can* use Q&A Write to produce a submission manuscript

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of my books, it's a real pain to do that.

Our agent asked for three copies of *Moat*, one to be sent via Federal Express as soon as possible. Those needed to be double-spaced. Roberta and Marilyn Niven both needed reading copies. Those would have 1½ spaces between lines. I'd need a master copy on which we could record editorial suggestions: double- or triple-spacing for that. It all had to be done over the weekend.

The prospect of using Q&A Write to produce five or six copies of a 490-page book was thoroughly daunting. Time, I figured, to try something else.

Alternatives

One possibility would be to use LapLink Mac to convert the book into a Mac file, read it into Aldus PageMaker, and print it with that. It would be fast and would come out beautifully. However, I'm not very familiar with PageMaker. Roberta uses it to produce the Opera League newsletter, but I haven't had much experience with it. Worse, though, I'd end up with a printout file I couldn't really edit and the book split between two machines.

There had to be another way.

I had recently received a copy of Microsoft Publisher for Windows. This seemed to have good layout capabilities—nothing like all the features of PageMaker, but enough for what I needed. However, when I looked through the manuals, there wasn't much about books and running heads of chapters. Microsoft Publisher is clearly intended for shorter things, like illustrated newsletters. Indeed, I like it enough that I am very likely to transfer to Publisher my "generic letter" that I send with my replies to BYTE mail. I'll have more on Publisher in an upcoming column; it has some excellent features. It's just not the right tool for printing a 490-page manuscript.

Ami Pro was another choice. Many of my friends swear by it. Alas, the version of Ami Pro I have was installed before I installed Windows. When I later installed Windows (and then updated the Windows installation several times with different versions of Windows 3.1), it must have done something to Ami Pro, because the program won't read in files any longer. An attempt to reinstall Ami Pro produced the message that my print drivers were obsolete and I should get new ones. I gather I have a fairly old version of Ami Pro. I'll get an update, but I sure wouldn't be using Ami Pro over the weekend.

Word for Windows

I also had a brand-new copy of Microsoft Word for Windows. Many people swear by Word, and I'm told that Word for Windows is even better. Chaos Manor has pretty well converted over to Windows 3.1, and the more work I can do with Windows programs, the better, so Word for Windows was an obvious choice.

Word for Windows can import several foreign file formats. It specializes in crushing WordPerfect (you can even configure Word for Windows to use WordPerfect keyboard commands). Alas, it never heard of Q&A Write.

That, however, was no problem, because Word for Word Professional from Mastersoft will convert files from Q&A Write to almost anything. Word for Word is simple to use; I've never had to bother with the manual. It will take wild cards for input and output, so all I had to do was tell Word for Word the input and output formats, put all the chapters of *Moat* into a single subdirectory, create an output subdirectory, and tell Word for Word to convert *.QW files to *.DOC files. The whole

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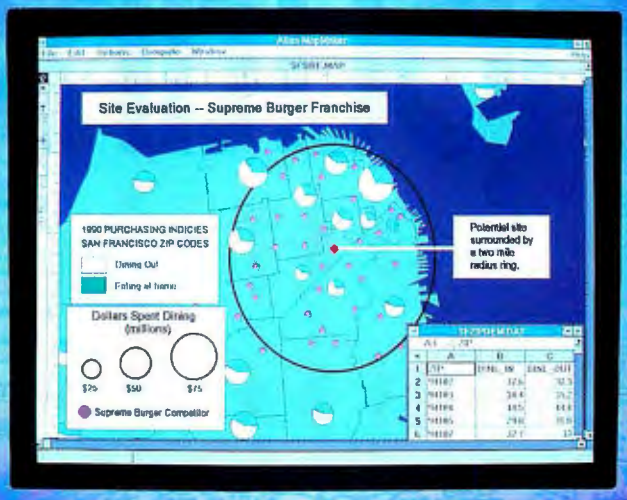
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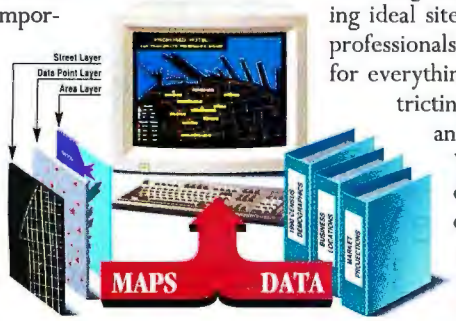


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thing, including the conversions, took under 5 minutes.

I'd previously installed Word for Windows. The interface is reasonably intuitive, although there are some conventions better conveyed by folklore than learned from the manuals and tutorials. A little mousing around showed how to bring in the 29 chapters of *Moat* one at a time, set the headers, set the typeface (on advice, I chose 12-point CG Times, a printable Windows font, as the main font), reformat to double spacing, and save it off. It was a snap, with the whole job done in under half an hour.

There was one immediate glitch: when I would read in the file, Word for Windows told me there were 767,356 characters and 135,000 words; the word count was in gray, indicating that it was an estimate. The statistics "windowlet" has an "update" button; clicking on that caused the program to trundle for a while and then proudly announce a total of 60,273 words; which, of course, was absurd. The average English word is five characters and a space; dividing the character count by 6 gives an estimate of 128,000 words.

I also have a word-count shareware program (several are available on BIX) that very speedily counts words in one or many files. It wasn't a big problem, but it was annoying. I've since learned, though, that all I needed to do was add 65,535 to the total shown. Word rolls over at that number.

The word count problem was annoying, but worse was in store.

LPT1 vs LPT1.DOS

Editing with Word for Windows is simple and intuitive. I'd say it was "Mac-like" except that, having used Wirth's Lilith before I ever saw a Mac, I'd prefer to say it's "Xerox-PARC-like." I'm still not used to black letters on a white background. From the earliest days, I've used a dark background and light letters for writing. Still, I could get used to it. Word for Windows is fast, and while I haven't used it much for text creation—I'm writing this with Q&A Write—I expect that I could grow to like Word for Windows a lot. If you're looking for a new text editor, this is a good one.

Once I had the text formatted properly, I pushed the print button. The program told me it was printing, but nothing was happening at the printer. That, of course, is because I had the Windows Print Manager turned on. Under Print Manager, a program first "prints" to a disk file, and only after the entire file is spooled onto the disk does any actual printing take place. This meant that before any printing began, I had the machine tied up for quite a bit of time. Eventually, though, it was done. The LaserJet III whirred—and then garbage came out.

There was nothing wrong with the printer. I could tell Q&A Write to print (running as a DOS program under Windows) in Times Roman, and it did that fine. But when I told any Windows program whatever to print in any font whatever, the result was garbage.

In despair, I used Q&A Write to print one copy of *Moat* and got that off to our agent. Then I got on BIX, explained the problem in my conference ("tojerry/queries"), and waited. Within an hour, I got a note from Jeff Sloman suggesting I call him. I did, and for an hour I experimented while the phone remained surgically attached to my ear.

We tried a lot of things. What fixed it was to go into the Control Panel, open the Printers icon, open the "connections" box,

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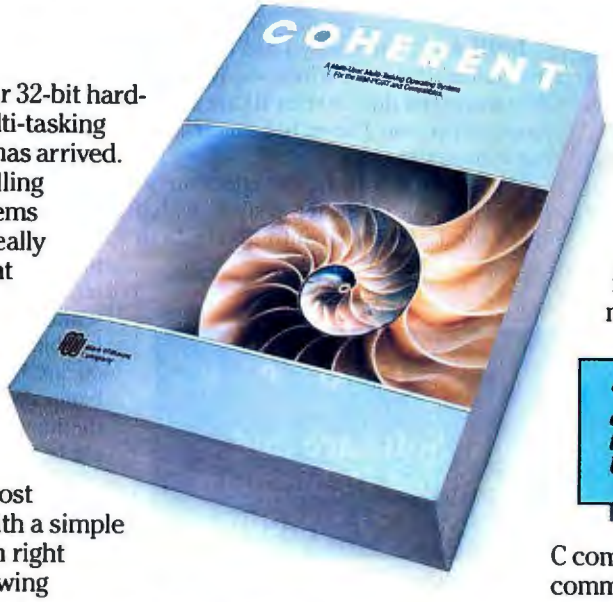
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and change the default printer connection from LPT1 to LPT1.DOS. This has the effect of taking Windows out of the picture, so to speak; that cured the problem.

As I write this, neither I nor anyone else knows why I have to print this way; on the other hand, I haven't experienced any problems.

I then had a perfect orgy of printing: Word for Windows and the LaserJet III print 290 pages single-spaced, or about 500 pages double-spaced, formatted in 12-point CG Times, in a little over an hour. No attendance was needed, other than making sure that the paper bin was kept filled.

I still don't know why I had to change the connections, but Windows, Word for Windows, and the LaserJet III are a winning combination. I never had a nicer-looking manuscript.

But I have a potentially better combination: the LaserMaster system, which turns the LaserJet III into a very high speed, high-resolution printer. That, alas, must wait until next month.

Winding Down

This is ridiculous: I have about a million things piled up that I need to write about. I have the NEC MultiSync 4FG monitor that, with an antiglare filter, is plain wonderful; highly recommended, a clear User's Choice Award for performance for the money.

I also have a Nanao FlexScan T560i monitor. It doesn't *need* an antiglare filter. I have it on my desk facing a south window, and it doesn't give me any eye trouble at all. The FlexScan is nothing like cheap, but it's wonderful. I never had a better monitor. It's so steady it seems like the images are painted on, and the colors are beautiful.

I have software overflowing in all directions. I have Corel Blockbuster, a SCSI board and CD-ROM drive packaged with Corel software. It all has to wait.

The book of the month is actually an author: Terry Pratchett. We get early copies of his books from England, so I'm not sure which ones are available here and which are not. If you see a Terry Pratchett book you haven't read, buy it with confidence. Pratchett writes comic fantasy. Sort of. It's funny with a twist. Try it; you'll like it.

The computer book of the month is Michael Hyman's *Windows 3.0 for BASIC Programmers* (Addison-Wesley, 1992); it gives good insights into how to do things with Windows and Realizer.

The game of the month is The Secret of Monkey Island II, in which the wicked pirate is avenged.

The exciting news from the CD-ROM Conference was the miniature Sony CD-ROM player and the upcoming Microsoft multimedia viewer that uses it. Next month, that, new CD-ROMs, and some observations on what's happening to the computer industry during the recession. Now I'm off to a program review of the SSX single-stage-to-orbit spaceship. With luck, it will fly in a year. ■

Jerry Pournelle holds a doctorate in psychology and is a science fiction writer who also earns a comfortable living writing about computers present and future. Jerry welcomes readers' comments and opinions. Send a self-addressed, stamped envelope to Jerry Pournelle, c/o BYTE, One Phoenix Mill Lane, Peterborough, NH 03458. Please put your address on the letter as well as on the envelope. Due to the high volume of letters, Jerry cannot guarantee a personal reply. You can also contact him on BIX as "jerryp."



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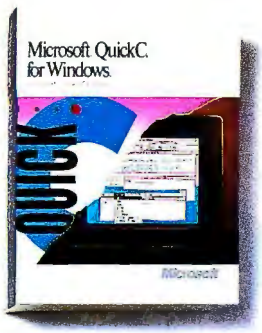
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Circle 1191 on Inquiry Card.

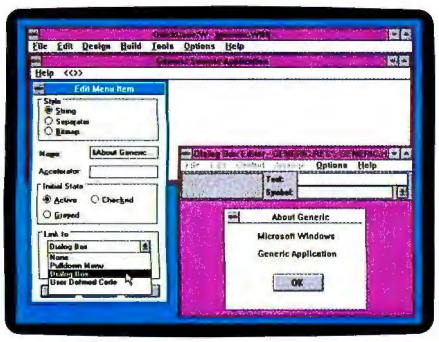
SP-2000AP.....$239
Seikosha America, Inc.
10 Industrial Ave.
Mahwah, NJ 07430
(800) 338-2609
(201) 327-7227
fax: (201) 818-9075
Circle 1192 on Inquiry Card.

Word for Word Professional 5.0.....$149
Mastersoft, Inc.
6991 East Camelback Rd.,
Suite A320
Scottsdale, AZ 85251
(800) 624-6107
(602) 277-0900
fax: (602) 970-0706
Circle 1193 on Inquiry Card.

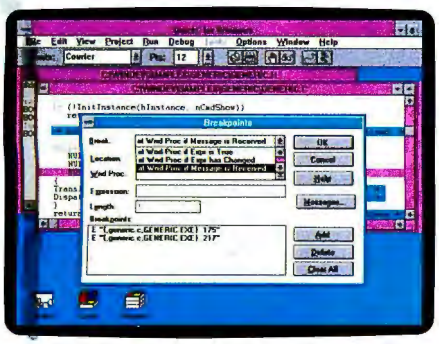


MICROSOFT SOFTWARE DEVELOPMENT TOOLS

Graphic proof that developing Windows apps is now easier.



Use QuickCase:W to draw the graphical elements of your Windows program, from menus and dialog boxes to cursors and icons. Then, let QuickCase:W generate commented expert-level C source code for the design that you've created.



QuickC for Windows supports a wide range of breakpoint types, from breaking at a location to breaking on a Windows procedure when a message is received.

Take a look at Microsoft® QuickC® for Windows™.

It's Windows-hosted, so you can edit, compile, and debug inside a single environment. Click on the Toolbar™ to choose frequently-used functions, from changing fonts to setting breakpoints. Workspace templates let you save your screen layouts, so you can reload them quickly from another session.

Plus, a remarkable tool known as QuickCase:W lets you create every element in your user interface with a few strokes of a mouse. Then it automatically generates the C source code you need.

All of which lets you create more applications. And more kinds of applications: C programs that call Windows APIs, graphical front-end programs for FORTRAN and COBOL, and C DLLs for other programs.

We suggest a visit to your Microsoft dealer. Because with QuickC for Windows, seeing is believing.

*© 1991 Microsoft Corporation. All rights reserved. Printed in the U.S.A. Inside the 50 United States, call (800) 541-1261, Dept. V75; outside the 50 United States, call (206) 936-8661. In Canada, call (416) 568-3503. Microsoft, CodeView, MS-DOS, QuickC and the Microsoft logo are registered trademarks and Windows, and Toolbar are trademarks of Microsoft Corporation. *As used herein, "DOS" refers to MS-DOS and PC-DOS operating systems.*

Key Features

- Windows-hosted integrated development environment including an editor, compiler, and debugger.
- All you need to write a Windows-based program.
- QuickCase:W generates source code from your program design and regenerates the code if you change the design.
- Wide range of breakpoint support, including breaking at a location, breaking when an expression has changed, and breaking at a Windows procedure when a message is received.
- Complete printed and online documentation on the Windows API.
- Toolbar for quick access to frequently used editing and debugging functions.
- Save Workspace and Load Workspace for saving and restoring window positions and breakpoints.
- Syntax highlighting in editor.
- Customizable tools menu allows you to run any Windows or DOS* program from within the QuickC for Windows environment.
- QuickWin library for converting well-behaved C programs for DOS to Windows programs.
- Generates Windows Executables, Windows Dynamic Link Libraries, QuickWin Executables for the Windows environment, and MS-DOS® Executables.

PROGRAMMER'S TIPS

- *To rebuild your character-based DOS applications to run under the Windows environment, select the "QuickWin EXE" Project type in the Options menu.*
- *Use the new and improved Dialog Editor to quickly and easily design dialog boxes for your programs.*

Microsoft
Making it easier

Thank you Byte Readers for Electing QEMM the Best Memory Manager

1989 BYTE AWARDS OF EXCELLENCE

1990 BYTE AWARDS OF EXCELLENCE

1991 BYTE AWARDS OF EXCELLENCE

1991 BYTE POURNELLE'S USER'S CHOICE AWARD

1992 BYTE READERS' CHOICE AWARD

From the beginning, Byte readers have been important to Quarterdeck's success. You were among the first to understand and appreciate our philosophy that the best software conforms to the standards *you* set.

We've never understood companies that want to reinvent the wheel by throwing out perfectly good hardware and software for nominal productivity gains. To us, productivity enhancements, by definition, must be economical and provide a high rate of return. They must pay for themselves quickly in more-efficient use of your time.

#1 *QEMM is the number one selling PC utility.*

QEMM-386 v.6 is our most recent achievement in memory productivity, and we feel it's an exceptional piece of software.

PC WEEK ANALYST'S CHOICE

INFO WORLD PRODUCT OF THE YEAR 1991

THE BEST LOTUS MAGAZINE

PC MAGAZINE EDITORS' CHOICE

PCComputing MVP MOST VALUABLE PRODUCT

These are just a few of our recent QEMM awards.

We're not alone. To date, QEMM has won more awards than all other memory managers put together. And it's become the number one selling PC utility in the world.

All of this has happened despite a lot of confusion in the marketplace regarding actual memory management performance and compatibility.

We've tried to simplify the issues and answer questions in the insert attached to this ad. The bottom line is that QEMM-386 v.6 provides memory availability far beyond what we believed possible only a year ago, by virtue of our breakthrough 'Stealth' technology.

These are not simple concepts for the typical PC user. And we credit much of our success to the support of computer 'gurus' like you, dear Byte reader.



A token of our appreciation.

As a 'thank you' for your support, we're offering an opportunity for Byte Readers to have our DESQview/X Funship, a $100 retail value, at a big savings-or, free with a DESQview purchased! See the attached insert for details. (Call us for another insert if it's already been removed).

Again, thanks for voting us number one.

Quarterdeck

Quarterdeck Office Systems, 150 Pico Boulevard, Santa Monica, CA 90405 (310) 392-9851 Fax (310) 314-4239
Quarterdeck International Ltd., B.I.M. House, Crofton Terrace, Dun Laoghaire Co. Dublin, Ireland Tel.(353) (1) 284-1444 Fax: (353) (1) 284-4380

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Circle 309 on Inquiry Card.

The 1992 Readers' Choice Awards

The best products picked by the toughest judges—BYTE readers

MICHAEL NADEAU

1992 BYTE READERS' CHOICE AWARD

BYTE readers are a special lot. You know and demand more than the average computer user does. The products you use must be on the cutting edge of technology yet practical for your needs. You also have a keen eye for value.

Each year, we ask you to vote for the products that meet with your high standards for use in a business environment. The results—with some surprises—are presented here. (Past BYTE Readers' Choice Award results have gone against prevailing opinion and market-share data. In fact, your views seem to be a leading indicator of brand preference. For instance, in 1991, you chose Borland's Quattro Pro as the top spreadsheet program before Lotus 1-2-3 began losing market share.)

Four items in particular are worth noting. The first is Apple's PowerBook, which took top portable honors as well as Hardware Product of the Year. Clearly, the PowerBook has a strong appeal outside the traditional Mac-installed base—take note, Toshiba, Compaq, et al. Then there's the Zeos Notebook 386, which took second in the rankings for portables. This proves not only that Zeos has a solid offering but that notebook buyers have embraced the mail-order channel.

The third item is Next's Nextstation, which tied for first place in the workstation category with IBM's RISC System/6000. Sales figures do not reflect this result, of course. You don't have to own a product to vote for it (after all, state of the budget usually takes precedence over state of the art). Perhaps Next's fortunes are about to take a turn for the better.

For Software Product of the Year, we might have guessed that Apple's System 7.0 or Microsoft Word for Windows 2.0 would be your choice—but no. Instead, you chose Microsoft's MS-DOS 5.0 for this honor. MS-DOS 5.0 has arguably improved the lives of more computer users than any other single product over the past year. Good choice.

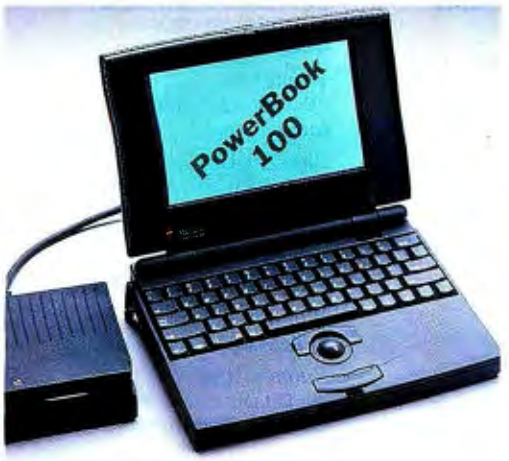
Other Items of Note

As with Congress, some incumbents seem to have a lock on their BYTE Readers' Choice Award titles. But unlike elected officials, these products retain their places of honor by consistently providing more for their constituents. To indicate return winners, we've placed an asterisk next to their names, even though some versions and model designations may have changed.

This year, we list not just the winners but also the runners-up to provide a wider perspective on each category. Please note, too, that during the time between creating the survey you filled out and printing the results here, some companies may have revised their products; therefore, we provide the most current versions in the Company Information box.

Congratulations to the winners of this year's BYTE Readers' Choice Awards. If you can win in this crowd, you've got it made.

continued



HARDWARE PRODUCT OF THE YEAR

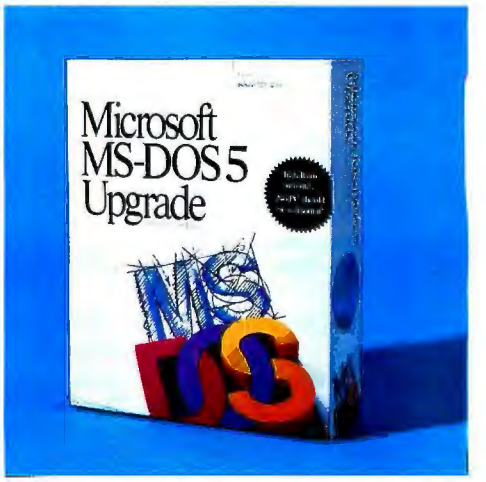
Winner
PowerBook series, *Apple Computer*

Runners-Up
HP LaserJet IIISi, *Hewlett-Packard*
Mac Quadra series, *Apple Computer*

SOFTWARE PRODUCT OF THE YEAR

Winner
MS-DOS 5.0, *Microsoft*

Runners-Up
Windows 3.0, *Microsoft*
Turbo C++, *Borland International*



HARDWARE

Gateway 2000 486DX



Hewlett-Packard HP 95LX



Hewlett-Packard HP LaserJet IIISi



HARDWARE PRODUCT OF THE YEAR

Winner
PowerBook series, ***Apple Computer***

Runners-Up
HP LaserJet IIISi, *Hewlett-Packard*
Mac Quadra series, *Apple Computer*

DESKTOP COMPUTERS—PC

Winner
486DX, *Gateway 2000*

Runners-Up
386DX, *Gateway 2000*
Dell 486, *Dell Computer*

DESKTOP COMPUTERS—MAC

Winner
Mac Quadra series, ***Apple Computer***

Runners-Up
Mac IIci and IIsi, *Apple Computer*

WORKSTATIONS

Winners (tie)
Nextstation, ***Next***
IBM RISC System/6000, ***IBM***

Runner-Up
Sparcstation IPX, *Sun Microsystems*

PORTABLES/ NOTEBOOKS

Winner
PowerBook series, ***Apple Computer***

Runners-Up
Notebook 386, *Zeos*
T2200SX, *Toshiba*

HAND-HELDS/PALMTOPS

Winner
HP 95LX, *Hewlett-Packard*

Runners-Up
Wizard, *Sharp Electronics*
Poqet PC, *Poqet Computer*

MODEMS (9600 bps)

Winner
Ultra 96, *Hayes Microcomputer Products

Runners-Up
Optima 96, *Hayes Microcomputer Products*
9600EX, *Intel*

MONITORS

Winner
MultiSync 4FG, *NEC Technologies

Runners-Up
Diamond Scan 16, *Mitsubishi Electronics America*
Nanao T560i, *Nanao USA*

LASER PRINTERS

Winner
HP LaserJet IIISi, *Hewlett-Packard

Runners-Up
HP LaserJet IIIp, *Hewlett-Packard*
HP LaserJet IIp Plus, *Hewlett-Packard*

VIDEO BOARDS— DOS/WINDOWS

Winner
VGAWonder XL, ***ATI Technologies***

Runners-Up
8514-Ultra, *ATI Technologies*
ProDesigner IIs, *Orchid Technology*

VIDEO BOARDS—MAC

Winner
PrecisionColor 24x, *Radius*

Runners-Up
Mac Display Card 8•24GC, *Apple Computer*
24XLTV, *RasterOps*

SOFTWARE

SOFTWARE PRODUCT OF THE YEAR

Winner
MS-DOS 5.0, *Microsoft*

Runners-Up
Windows 3.0, *Microsoft*
Turbo C++, *Borland International*

WORD PROCESSING SOFTWARE—DOS/WINDOWS

Winner
WordPerfect 5.1, *WordPerfect

Runners-Up
Word for Windows 2.0, *Microsoft*
Ami Pro 2.0, *Lotus Development*

WORD PROCESSING SOFTWARE—MAC

Winner
Word for Macintosh 5.0, ***Microsoft***

Runners-Up
WordPerfect 2.1, *WordPerfect*
MacWrite II 1.1, *Claris*

CAD SOFTWARE— DOS/WINDOWS

Winner
AutoCAD release 11, *Autodesk

Runners-Up
Generic CADD 6.0, *Generic Software*
DesignCAD, *American Small Business Computers*

CAD SOFTWARE—MAC

Winner
Claris CAD, *Claris

Runners-Up
DesignCAD 2D/3D, *American Small Business Computers*
Vellum, *Ashlar*

CONTACT MANAGERS/ PERSONAL INFORMATION MANAGERS

Winner
Agenda 2.0, *Lotus Development

Runners-Up
PackRat 4.0, *Polaris Software*
askSam, *askSam Systems*

DATABASE MANAGERS, PROGRAMMABLE— DOS/WINDOWS

Winner
Paradox 3.5, *Borland International

Runners-Up
FoxPro 2.0, *Fox Software*
dBase IV, *Borland International*

DATABASE MANAGERS, PROGRAMMABLE—MAC

Winner
FileMaker Pro, *Claris

Runners-Up
4th Dimension, *Acius*
Omnis 7, *Blyth Software*

DATABASE CLIENT/SERVER

Winner
NetWare SQL, *Novell

Runners-Up
Oracle Server, *Oracle*
SQL Server, *Microsoft/ Sybase*

DESKTOP PUBLISHING SOFTWARE—DOS/WINDOWS

Winner
PageMaker 4.0 for Windows, *Aldus

Runners-Up
Ventura Publisher 4.0 (Windows), *Ventura Software*
PFS: First Publisher, *Spinnaker Software*

DESKTOP PUBLISHING SOFTWARE—MAC

Winner
PageMaker 4.2 for Macintosh, *Aldus

Runners-Up
Ventura Publisher 3.0, *Ventura Software*
QuarkXPress 3.1, *Quark*

DESKTOP PUBLISHING SOFTWARE—UNIX

Winner
FrameMaker, *Frame Technology

Runners-Up
Interleaf 5 (formerly TPS/ Slim), *Interleaf*
Island Write/Paint/Draw, *Island Graphics*

E-MAIL AND WORKGROUP SOFTWARE—DOS/WINDOWS

Winner
cc:Mail, *Lotus Development*

Runners-Up
Microsoft Mail (Windows), *Microsoft*
WordPerfect Office 3.1, *WordPerfect*

E-MAIL AND WORKGROUP SOFTWARE—MAC

Winner
Microsoft Mail, *Microsoft*

Runner-Up
cc:Mail, *Lotus Development*

GRAPHICS SOFTWARE—DOS/WINDOWS

Winner
CorelDraw 2.01L for Windows, *Corel Systems

Runners-Up
Designer 3.1, *Micrografx*
Adobe Illustrator 4.0 for Windows, *Adobe Systems*

GRAPHICS SOFTWARE—MAC

Winner
Adobe Illustrator 3.0.1, *Adobe Systems

Runners-Up
MacDraw Pro 1.0, *Claris*
Canvas 3.0, *Deneba Software*

NETWORK OPERATING SYSTEMS—DOS AND OS/2

Winner
NetWare 3.11, *Novell

Runners-Up
LANtastic, *Artisoft*
LAN Manager, *Microsoft*

NETWORK OPERATING SYSTEMS—MAC

Winner
NetWare 3.0, *Novell

Runners-Up
AppleShare 3.0, *Apple Computer*
TOPS 3.0, *Sitka*

MEMORY MANAGERS

Winner
QEMM 386, *Quarterdeck Office Systems*

Runners-Up
386Max 6.0, *Qualitas*
386|VMM, *Phar Lap Software*

OPTICAL CHARACTER RECOGNITION SOFTWARE

Winner
OmniPage Professional 2.0, *Caere*

Runners-Up
ReadRight for Windows 3.11, *OCR Systems*
WordScan+, *Calera Recognition Systems*

OPERATING SYSTEMS/ ENVIRONMENTS

Winner
MS-DOS 5.0, *Microsoft*

Runners-Up
Windows 3.0, *Microsoft*
System 7.0, *Apple Computer*

PROGRAMMING LANGUAGES—DOS/WINDOWS

Winner
Turbo C++, *Borland International

Runners-Up
Visual Basic, *Microsoft*
Turbo Pascal, *Borland International*

PROGRAMMING LANGUAGES—MAC

Winner
Zortech C++ 2.1.3, *Symantec*

Runners-Up
HyperCard 2.1, *Claris*
Think C 5.0, *Symantec*

PROJECT MANAGEMENT SOFTWARE

Winner
Project for Windows 3.0, *Microsoft

Runners-Up
Harvard Project Manager, *Software Publishing*
Time Line 5.0, *Symantec*

SPREADSHEETS—DOS/WINDOWS

Winner
Quattro Pro 3.0, *Borland International

Runners-Up
Excel for Windows, *Microsoft*
Lotus 1-2-3 2.3, *Lotus Development*
Lotus 1-2-3 3.1+, *Lotus Development*

SPREADSHEETS—MAC

Winner
Excel for Macintosh, *Microsoft*

Runners-Up
Lotus 1-2-3 for Macintosh, *Lotus Development*
Wingz, *Informix Software*

UTILITIES—DOS/WINDOWS

Winner
Norton Utilities 6.0, *Symantec

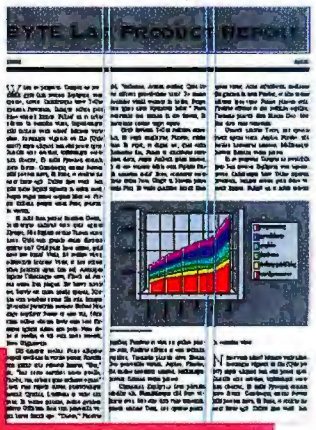
Runners-Up
PC Tools Deluxe 7.1, *Central Point Software*
Norton Desktop for Windows, *Symantec*

UTILITIES—MAC

Winner
Norton Utilities for Macintosh 1.1, *Symantec*

Runners-Up
Mac Tools Deluxe, *Central Point Software*
Symantec Utilities (SUM) II 2.1, *Symantec*

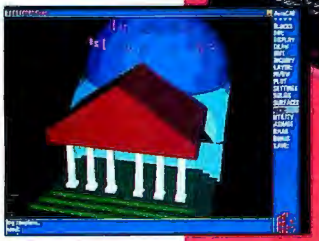
PageMaker 4.2



CorelDraw 2.01L for Windows



AutoCAD release 11



COMPANY INFORMATION

Acius, Inc.
4th Dimension
10351 Bubb Rd.
Cupertino, CA 95014
(408) 252-4444
fax: (408) 252-0831
Circle 984 on Inquiry Card.

Adobe Systems, Inc.
Adobe Illustrator 3.0.1
Adobe Illustrator 4.0
1625 Charleston Rd.
P.O. Box 7900
Mountain View, CA 94039
(800) 833-6687
(415) 961-4400
fax: (415) 961-3769
Circle 985 on Inquiry Card.

Aldus Corp.
PageMaker 4.2 for Macintosh
PageMaker 4.0 for Windows
411 First Ave. S
Seattle, WA 98104
(206) 622-5500
fax: (206) 622-4240
Circle 986 on Inquiry Card.

American Small Business Computers, Inc.
DesignCAD 3D
DesignCAD 2D/3D
1 American Way
Pryor, OK 74361
(918) 825-4844
fax: (918) 825-6359
Circle 987 on Inquiry Card.

Apple Computer, Inc.
Macintosh Display Card 8•24GC
AppleShare 3.0
Mac IIci
Mac IIsi
Mac Quadra series
PowerBook series
System 7.0
20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010
Circle 988 on Inquiry Card.

Artisoft, Inc.
LANtastic
691 East River Rd.
Tucson, AZ 85704
(800) 846-9726
(602) 293-4000
fax: (602) 293-8065
Circle 989 on Inquiry Card.

Ashlar, Inc.
Vellum
1290 Oakmead Pkwy.,
Suite 218
Sunnyvale, CA 94086
(408) 746-1800
fax: (408) 746-0749
Circle 990 on Inquiry Card.

askSam Systems
askSam
P.O. Box 1428
Perry, FL 32347
(904) 584-6590
fax: (904) 584-7481
Circle 991 on Inquiry Card.

ATI Technologies, Inc.
8514-Ultra
VGAWonder XL
3761 Victoria Park Ave.
Scarborough, Ontario,
Canada M1W 3S2
(416) 756-0718
fax: (416) 756-0720
Circle 992 on Inquiry Card.

Autodesk, Inc.
AutoCAD release 11
2320 Marinship Way
Sausalito, CA 94965
(415) 332-2344
fax: (415) 331-8093
Circle 993 on Inquiry Card.

Blyth Software
Omnis 7
1065 East Hillsdale Blvd., Suite 300
Foster City, CA 94404
(800) 346-6647
(415) 312-7100
fax: (415) 571-1132
Circle 994 on Inquiry Card.

Borland International
dBase IV
Paradox 3.5
Quattro Pro 3.0
Turbo C++
Turbo Pascal
1800 Green Hills Rd.
P.O. Box 660001
Scotts Valley, CA 95066
(408) 438-8400
fax: (408) 439-9344
Circle 995 on Inquiry Card.

Caere Corp.
OmniPage Professional 2.0
100 Cooper Court
Los Gatos, CA 95030
(800) 535-7226
(408) 395-7000
Circle 996 on Inquiry Card.

Calera Recognition Systems, Inc.
WordScan+
475 Potrero Ave.
Sunnyvale, CA 94086
(408) 720-8300
fax: (408) 720-1330
Circle 997 on Inquiry Card.

Central Point Software, Inc.
Mac Tools Deluxe
PC Tools Deluxe 7.1
15220 Northwest Greenbrier
Pkwy., Suite 200
Beaverton, OR 97006
(503) 690-8090
fax: (503) 690-8083
Circle 998 on Inquiry Card.

Claris Corp.
Claris CAD
FileMaker Pro
HyperCard 2.1
MacDraw Pro 1.0
MacWrite II 1.1
5201 Patrick Henry Dr.
Santa Clara, CA 95052
(408) 987-7000
fax: (408) 987-4400
Circle 999 on Inquiry Card.

Corel Systems Corp.
CorelDraw 2.01L
1600 Carling Ave.
Ottawa, Ontario,
Canada K1Z 8R7
(613) 728-8200
fax: (613) 728-9790
Circle 1060 on Inquiry Card.

Dell Computer Corp.
486P/33
9505 Arboretum Blvd.
Austin, TX 78759
(800) 232-5620
(512) 338-4400
fax: (512) 343-3312
Circle 1062 on Inquiry Card.

Deneba Software
Canvas 3.0
3305 Northwest 74th Ave.
Miami, FL 33122
(305) 594-6965
fax: (305) 477-5794
Circle 1063 on Inquiry Card.

Fox Software
FoxPro 2.0
134 West South Boundary
Perrysburg, OH 43551
(419) 874-0162
fax: (419) 874-8678
Circle 1064 on Inquiry Card.

Frame Technology Corp.
FrameMaker
1010 Rincon Cir.
San Jose, CA 95131
(408) 433-3311
Circle 1065 on Inquiry Card.

Gateway 2000
486DX
386DX
610 Gateway Dr.
P.O. Box 2000
North Sioux City, SD 57049
(800) 523-2000
(605) 232-2000
fax: (605) 232-2023
Circle 1066 on Inquiry Card.

Generic Software, Inc.
Generic CADD 6.0
11911 North Creek Pkwy.
South Bothell, WA 98011
(206) 487-2233
(800) 228-3601
fax: (206) 483-6964
Circle 1067 on Inquiry Card.

Hayes Microcomputer Products, Inc.
Ultra 96
Optima 96
P.O. Box 105203
Atlanta, GA 30348
(404) 840-9200
fax: (404) 441-1238
Circle 1068 on Inquiry Card.

Hewlett-Packard Co.
HP 95LX
1000 Northeast Circle Blvd.
Corvallis, OR 97330
(503) 757-2000
fax: (503) 750-3399
Circle 1235 on Inquiry Card.

Hewlett-Packard Co.
HP LaserJet IIp
HP LaserJet IIIp
HP LaserJet IIISi
Direct Marketing Organization
P.O. Box 58059
Santa Clara, CA 95051
(800) 752-0900
Circle 1236 on Inquiry Card.

IBM Corp.
IBM RISC System/6000
U.S. Marketing and Services
1133 Westchester Ave.
White Plains, NY 10604
(800) 365-4426
Circle 1237 on Inquiry Card.

Informix Software, Inc.
Wingz
4100 Bohannon Dr.
Menlo Park, CA 94025
(415) 926-6300
Circle 1238 on Inquiry Card.

Intel Corp.
9600EX
PC Enhancement Division
5200 Northeast Elam Young Pkwy.
Hillsboro, OR 97124
(503) 696-7086
Circle 1239 on Inquiry Card.

Interleaf, Inc.
Interleaf 5
Prospect Place
9 Hillside Ave.
Waltham, MA 02154
(617) 290-0710
fax: (617) 290-4943
Circle 1240 on Inquiry Card.

Island Graphics Corp.
Island Write/Paint/Draw
4000 Civic Center Dr.
San Rafael, CA 94903
(415) 491-1000
fax: (415) 491-0402
Circle 1241 on Inquiry Card.

continued



WE DIDN'T HAVE TO PUT OUR OPTICAL PRODUCTS ON PEDESTALS. JERRY POURNELLE DID.

"**I am pleased to report that I'm sold. The Pioneeer optical drive... is as solid as a rock.**... Thus, I'm discontinuing testing. Now I'll just use the drive. ...I now rely on the Pioneer erasable optical disks for backup, for primary storage of really big files, and for archive copies of software... you really need something **so easy** to use that you'll routinely use it for backup... **the Pioneer DE-S7001 will do the job very well indeed. Recommended.** *Byte (9/91)*

The Pioneer six-pack CD-ROM Minichanger is great. We've had it in operation for the best part of the year now, on a number of different systems.... **It has always performed flawlessly**... it changes drives a lot faster than you'd expect it to.... **It's really fast**.... Accesses that used to take many seconds are now nearly instantaneous. Accesses that took over a minute now take a few seconds. **I always did like the Minichanger**.... **Now it's even better**.... Incidentally, the Pioneer Minichanger will work just fine with a Mac. *Byte (10/91)*

The Pioneer DE-S7001 dual-purpose external optical disk drive I've written about before. Log your wordprocessor to that, save early and often, and you'll have it all.... In a word, WORM drives look like **the ultimate in backup storage.** *Byte (12/91)*

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I have the DRM-600 running not only with QEMM386.SYS, but inside DESQview windows, which has the amusing result that I can actually have several CD-ROM windows open at once.... **It's surprising** how fast you can switch back and forth among them.... The Pioneer DRM-600... **it's very convenient** to have a bunch of CD-ROMs available without swapping. *Byte (1/91)*

It's quite intuitive [the Pioneer CD-ROM Minichanger]: *no* instructions are required.... **Recommended**. *Byte (1/91)*

This technology is coming of age. *Byte (1/91)*"



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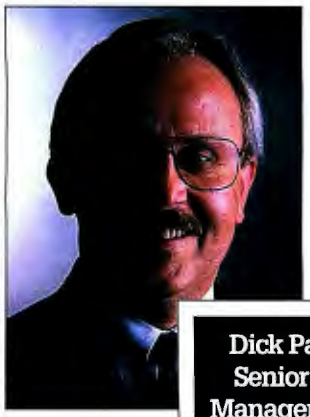
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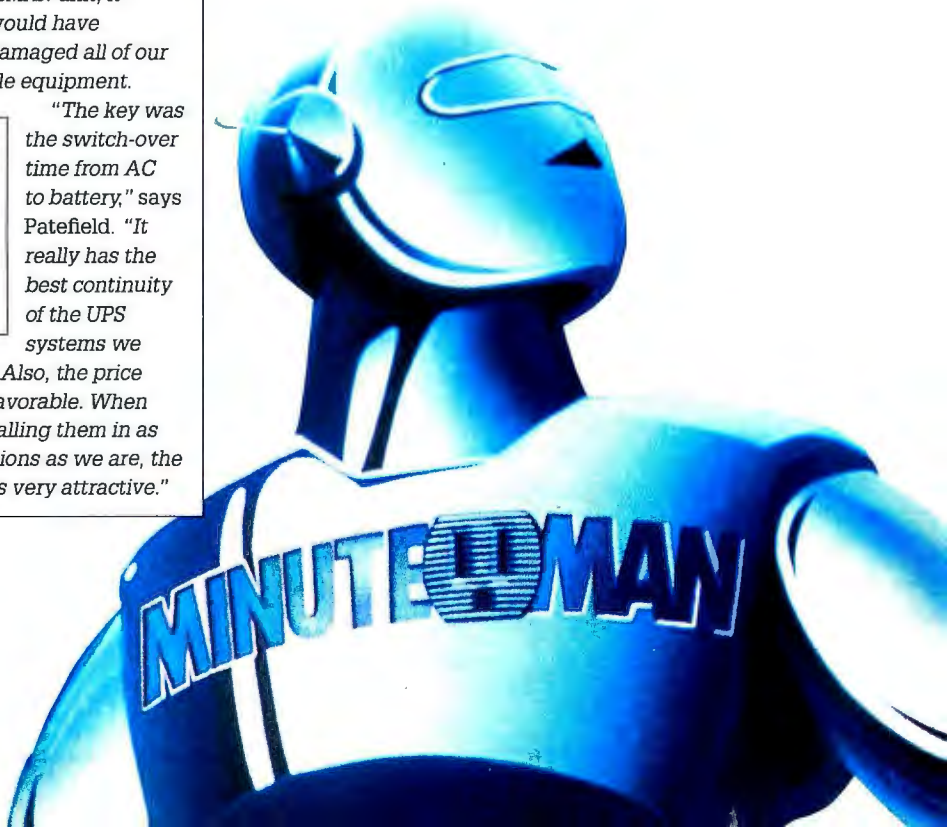
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FEATURE



PRACTICAL DESKTOP VIDEO PART 3

Winning Graphics

With the right software, you can easily add text, pictures, and animation to your video presentation

TOM YAGER

Today's desktop computers are graphics powerhouses. Capable of creating and manipulating high-resolution images of 16 million colors, their potential is wasted if you use them in desktop video only to control your peripherals. Computer-generated graphics are a pivotal element of most desktop-produced videos. In fact, they're so important that I'll devote this entire article to the creation of graphics for video.

You don't need to be an artist to create impressive graphics for your desktop videos. You simply need to start with the right graphics hardware and software and then learn to compose graphics that capture the audience's attention but don't distract them from your message. Once you read this article, you should have no problems getting started—then the rest is up to you.

Getting What You Want

In a perfect world, a computer would do everything you wanted it to. With desktop video, as with other applications, different systems have various strengths and weaknesses, thanks to the selection of software that exists for each platform. My work is undoubtedly different than yours, so I can't advise you what to buy. I'm hoping, however, that by detailing some of the choices I made, you can gain some helpful insights. Thus, this article is by no means a complete roundup of graphics products and techniques; rather, it is one traveler's tale, detailing a few of the many possible approaches to desktop video graphics.

I set out to endow each of the BYTE Multimedia Lab's three systems with as much self-sufficiency as possible. Where graphics are concerned, I largely succeeded: All three machines are capable of generating their own two-dimensional and 3-D graphics, suitable for inclusion in a video production. I have the freedom to cheat, of course, since I have three fairly powerful machines within a rolling chair's distance of one another. So yes, I do tend to mix and match a bit, and I use the Lab's machines a lot simply because they're there. A multiplatform setup has a lot to recommend it. If you have the means, you should consider broadening your options by constructing a multiplatform facility.

Living in Flatland

The majority of graphics work for video gets done in 2-D. But these days, most 2-D graphics software is graced with the ability to make its graphics look 3-D, without the processing overhead of real 3-D.

When people think of producing computer graphics, they generally think of paint programs. While these do the job, they make life more difficult for those of us who couldn't create real art to save our lives. I prefer to work at a higher level, leaning toward tools that permit me to do artistic things. That's not to say I don't apply creativity; I just apply it at a different level.

For example, I have two ways to create a rectangle on the screen and make it appear to be floating above the background. Using a paint package, I can draw an underlying rectangle whose color is slightly darker than that of the background and place it to look like a shadow. Then I can draw a rectangle on top to achieve the simulated depth. I prefer, however, to use a drawing package so that I simply draw a rectangle and then tell the program to put a shadow under it. That way, when I move the rectangle, the shadow moves with it, and I do not have to worry about precise positioning of my graphics. That's a fair example, but there are a number of more complex

BYTE ACTION SUMMARY

Graphics for desktop video comes in three basic styles: text, 2-D images, and 3-D images and animations. Text and 2-D images are easy to manipulate; 3-D is more difficult, but it can add a professional touch to your desktop video presentations.

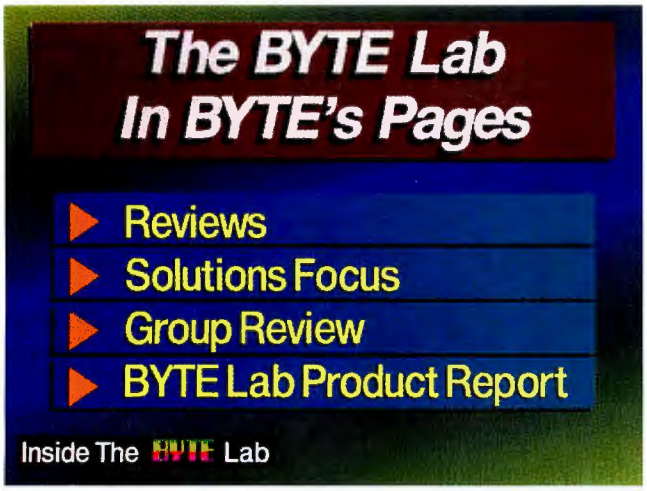


Photo 1: *A sample video screen incorporating text with shaded backgrounds, produced with RIO from AT&T Graphics Software Labs.*

operations that are much harder to do with paint programs than with the class of products that I'll call "presentation graphics software," for lack of a better moniker.

Producing good-looking graphics is like anything else in video work: You should recognize your limitations and stay within them. For me, accepting that I'm no artist means that I avoid getting too ambitious with my graphical creations. With music, it's amazing what you can create with just 12 notes. With graphics, you can go a long way combining simple shapes and text.

They're Only Words

Almost all graphics created for video include some kind of text, and the most common graphics pages are mostly text. So it pays to keep a few commandments in mind when placing text in videos. The first rule is one you're probably familiar with from desktop publishing: The fewer typefaces on a page, the better. In fact, people will admire your self-restraint if you limit yourself to one or two throughout a video. Typeface changes confuse the eye, and that confusion might cause your audience to tune out your message. One typeface, in multiple sizes and in bold and italic variations, is often all you need, even if it doesn't seem like much fun.

When selecting a font, remember that once it hits your videotape, some unpleasant things are going to happen to it. NTSC video is interlaced—the display first paints the odd-numbered scan lines and then the even-numbered ones. Thus, by design, NTSC video is doing a constant vertical jitterbug. Thin lines jitter more than fat ones, so you need to keep your type sizes big enough to avoid thin lines. Most of the time, I use boldface text. Jittering also affects serif fonts, such as the one used on this page, more than sans serif fonts such as this. Sans serif fonts are more readable in smaller sizes, although serif fonts look just dandy in headlines and other large text.

You also need to remember that a videotape doesn't have the resolution and clarity of your computer's monitor. The smaller your text, the more interlacing and reduced resolution will affect it. Remember, too, that your audience probably won't be sitting as close to the screen as you will when you make your video. If you can easily read your text from a good distance, then you sized it properly. The best solution is to make your text as large as you can without making it appear to scream at the viewer—unless you're doing a video for a tractor pull. If you have a lot of text to present, don't be bashful about splitting it up into as many screens as needed to maintain a clear viewing size. Also, you should leave plenty of space between rows of text.

Setting the Table

If you're the impatient sort, you might be moved to throw a lot of black letters on a white background and be done with it. That won't impress anyone, however, and it negates a large part of the impetus for doing a video in the first place: to boost your image or your company's. Text works better when placed over an appealing background, and it doesn't take much more work to turn a screen of plain text into something that people notice.

So, what makes an appealing background? First, it can't be too busy. When you shoot a photograph, you're advised to keep the background uncluttered; the same is true for graphical backgrounds. A good background contrasts enough with the text so that the text stands out. Setting up contrast involves choosing colors, which opens a new can of worms.

You can't take color for granted in a video. Obviously, some colors don't go together—where are Garanimals when you need them? However, you should keep in mind that brighter shades tend to bleed when you record them, and too many bright colors in a scene can distort the recorded signal. For that reason, you should remain within a safe range of *legal* colors, which means avoiding the top and bottom of color intensities. If your graphics package expresses colors numerically as a mixture of RGB values between 0 and 255, you should probably stay between 20 and 240 for each of the three values. Staying in the legal color range also keeps contrasts under control, further reducing the impact interlace has on your graphics.

But legal doesn't have to be boring. A much-used, but effective, way to spice up graphics backgrounds is with gradation. Most graphics packages let you paint your background and the objects you create with smoothly changing patterns of color. A two-color gradation frequently goes from one shade to a lighter or darker shade of the same color, but you can be more creative. A gradation from blue to earthy brown suggests a horizon; from deep orange to deep brown, a sunset. Some packages let you set several gradation points: You can start with dark blue, move to a lighter blue in the middle, and then to dark brown. A conservatively gradated background is probably the most effective way to improve your text screens, and it's so simple to do.

When you place your gradation points, keep in mind the text or other graphical elements that you will place over the background. For example, you might go from a light shade at the top to a darker shade at the bottom and then place a dark-colored (or shadowed) text headline at the top and a lighter-colored body text below. The shading of the background will call attention to your headline, and then it gets out of the way, so the viewer can read the rest of the text.

If you still want to spice up your background, you can use shaded shapes to separate your text (see photo 1). Done right, this helps guide the viewer's eye, making sure he or she doesn't miss any of the most important points. For me, this combination of a main background and subbackgrounds makes the most attractive backdrop.

Once you've got a background that works, save the graphics without the text. This then becomes a template, and you should use only a few templates in your video. That kind of predictability may seem banal, but it works to your advantage. After a viewer sees your template once, his or her trained eyes will quickly jump to emphasized areas when the template appears again.

Of course, there's more to graphics than text and backgrounds. How much more you can do is a function of your graphics software, so I'll move on and discuss some specific tools.

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Doing It

Creating the kind of text-over-graphics screens I've just described is no great exercise on the PC and the Mac. It is, however, a little tougher on an Amiga equipped with Newtek's Video Toaster, because it uses a paint package. But fret not—you can still do it.

It's impossible not to have favorites, and of the 2-D presentation graphics programs I've used, I have yet to find the equivalent to AT&T Graphics Software Labs' (GSL) RIO for the PC. RIO is powerful yet extraordinarily easy to use, and there's no quibbling with the gorgeous results (see photo 1, which was created using RIO). A high-end professional graphics package, RIO renders the scenes you draw using antialiasing, which reduces jagged edges and increases the apparent resolution. It also adjusts your colors to legal NTSC values. RIO uses its own scalable font system, so you can draw, stretch, rotate, and manipulate text any way you like. It also incorporates image mapping, so you can paint scanned images, video captures, and other graphics files onto drawn shapes (including text). In fact, RIO includes built-in support for scanners, printers, and video capture, eliminating the need to purchase additional tools.

RIO, like most 2-D graphics packages, uses polygons and ellipses for creating drawings. Each shape that you draw is a distinct object with associated attributes. With a couple of mouse-clicks on an object, you can add shadows, change a solid color to a multipoint gradation, make it partially transparent, or map an image to the shape. Everything can be moved, resized, and rotated freely. Scenes come together quickly in RIO, thanks partly to the speed of Truevision's ATVista board and partly because RIO drives the board so well. RIO even gives you complete control over the board's settings from within the program. RIO also includes a charting module for business graphics and the option of animating your 2-D scenes, making it even more unnecessary to rely on other graphics packages. RIO's output is breathtaking; I highly recommend it for professional 2-D graphics work.

On the Mac, people tend to use a combination of disjoint tools because Mac tools generally integrate better. My 2-D videographics work is no exception. I do the bulk of my drawing in what you might consider an odd choice: Symantec's More. While it's primarily targeted at creating slides and Mac-based presentations, More has several features that make it a good match for video graphics. Like RIO, it maintains object distinctions and attributes and can apply gradations and shadows. But while it lacks RIO's "do-everything" acumen, More has a couple of tricks that even RIO doesn't include. It has a wide selection of default gradation patterns, and it can create a simulated 3-D look by adding beveled shading to objects (which makes a rectangle look like a plaque). On a Mac running Adobe Type Manager or TrueType, More draws text in scalable fonts, although it can't stretch and alter them the way RIO can. More serves double duty in the Multimedia Lab, since it includes a powerful outlining tool that I use for planning videos. Finally, while More can't map images to shapes, it can scale and place imported graphics files.

What More can't do, other Mac graphics packages (e.g., Adobe Photoshop and Illustrator) pick up. Most often, however, I simply run what I've built in More through Ray Dream's JAG (jaggies are gone). JAG antialiases the drawing and applies NTSC legalization—steps RIO led me to appreciate.

The Toaster's 2-D graphics module pales next to RIO, but RIO alone costs more than the combined Toaster hardware and software bundle. The module, called ToasterPaint, is powerful, although a bit quirky. The problem is that, like most paint systems, objects lose their identity once they're "tacked down" on the background. That means you must carefully build your graphics from the bottom up. Once you place a graphic, it's an indelible part of the drawings. ToasterPaint handles image mapping and transparency, and because it runs on the Toaster, you can grab frames of video and save them as still images that can be loaded from the Toaster's switcher module.

To simplify things, the Toaster also includes a CG (character generator). This mock-up of an expensive broadcast TV CG is quite capable, and it can create its own smoothly gradated backgrounds. It can also import backgrounds from ToasterPaint, so while you don't have the freedom to easily modify elements of your graphical backgrounds, at least you can work with your text independently. The Toaster's CG includes a huge library of bit-mapped fonts, so you can use only the sizes Newtek supplies you with. However, the fonts include special color ones (e.g., metallic) that offer you a variety of impressive and playful text effects (e.g., crayons bent into letters) you can't get in RIO or More. Like RIO, the Toaster's CG renders text in a separate step but without antialiasing. It handles shadows, however, and it can import text files from other sources.

Photo 2 shows three variations of a scene that includes a layered background, some text, and a captured video image that was created with RIO, More/JAG, and the Toaster, respectively. Don't dig out a magnifying glass and look for differences; the point is to show that each combination of platform and software is capable of generating fine-looking results.

One final note on 2-D graphics: The creation of graphics for video overlay (titling) is usually done at editing time so that the titles don't obscure the video they overlay. Editing is the subject of next month's installment in the series.

A New Dimension

When even simple 3-D scenes take considerably more work than 2-D graphics, you may wonder why you should bother. The

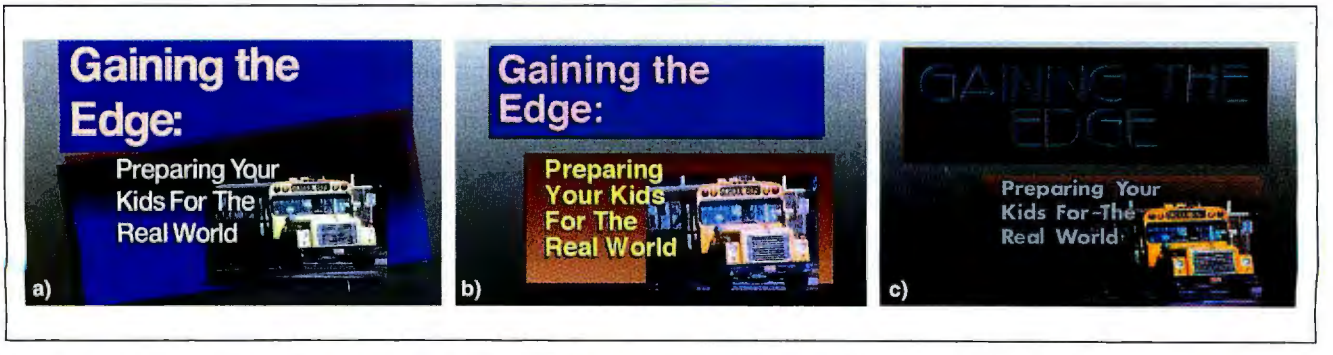


Photo 2: *A more complex 2-D scene, created with* **(a)** *RIO on the PC,* **(b)** *More and JAG on the Mac, and* **(c)** *Video Toaster on the Amiga.*



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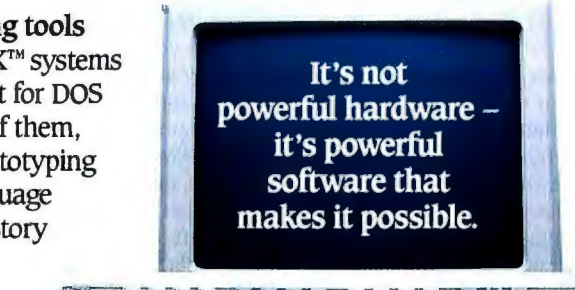
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Photo 3: *A Topas storyboard showing the opening title animation for the "Inside the BYTE Lab" video.*

reason is obvious: 3-D can turn the simplest video into a highly polished presentation.

The most direct use for 3-D is to create backgrounds. Unlike 2-D backgrounds, you have to worry about where the camera (point of view) is, where your lights are, and the arrangement of objects in 3-D instead of 2-D. The advantage is that while 2-D looks good, 3-D looks real. Instead of a gradated background, for example, you can draw a rectangular object and place a light at the upper-left corner of it. That light affects both the background rectangle and any text or other objects you place in front of the rectangle.

When you use text in a 3-D package, you're not creating flat graphical shapes. Characters have depth, can reflect light, and can cast realistic shadows. By extruding your text, the letters take on a sculpted look, and the way light bounces off the surfaces created by an extrusion can make them easier to read.

While doing simple text and backgrounds in 3-D looks impressive, it's clearly not cool enough to justify the high cost of a 3-D package. (The exception is the Toaster, where 3-D is part of the basic package.) The most exciting use of 3-D is in animation.

If animation makes you think of Mickey Mouse, think again. Also, if you assume 3-D animation is out of your reach, you're wrong. Today's tools make 3-D animation available to anyone willing to invest some time in learning and practicing.

The reigning example of animation in corporate video is the flying logo, which is now so common that it's all but expected. For what it's worth, the cost to have a 3-D flying logo done professionally exceeds the price of any of the 3-D packages I'm about to discuss. In fact, building animation capability into your desktop video setup needn't involve additional hardware expense because most of the boards that control video decks during editing sessions can also handle animation.

I don't have the space here to launch into a detailed tutorial on 3-D, so I'll just mix technique and tools together. Say I want to create a flying BYTE logo, and since I'm animating anyway, I'll also create a tantalizing opener for my "Inside the BYTE Lab" video. The total length of the animation will be about 10 seconds.

I'll start with the Amiga this time. Release 2.0 of the Toaster refined its 3-D package, Lightwave 3D. The new, improved Lightwave 3D now does ray tracing, and while it's impressive stuff, ray tracing creates a serious problem for 3-D animation: time.

I need to digress here for a moment to talk about the time it takes to do 3-D. Few things stress a CPU more than rendering a 3-D image, and the more realistic the scene, the longer it takes to render. If you want shadows, you increase the rendering time. If you want objects to show reflections of other objects, you add still more time. However, if you ray trace, adding refraction and lending awesome realism to reflections and shadows, you may run out of time.

NTSC video rolls by at 30 frames per second, so when you create animation, you generally have to do 30 renders for each second of video. A simple scene—rendered without shadows, reflections, or ray tracing—might complete in a few minutes on a fast machine. For my 10-second opener, using fairly low grade animation, I'm looking at 10 hours of rendering time. That's hardly "while you wait," and it gets worse: Shadows would probably double the time required, while ray tracing can easily require multiple hours or even days to render each frame. And while your video equipment is tied up doing animation, you can't use it for anything else; the 3-D program must have exclusive, constant control of the recorder, unless you're rendering to files on disk. The latter case often makes more sense and leads me to suggest again that you consider a multisystem facility, if not multiplatform. That way, you can dedicate the fastest box in the house to your 3-D project, while continuing to use the rest of your facility to pull together the other elements of your video.

Back to Lightwave 3D. Like many 3-D systems, Lightwave 3D splits the work between two modules: You build objects in the modeler and then pass them to the renderer for layout and animation. I'm no great fan of Lightwave's modeler, but it works well enough, and you can import objects from other 3-D tools. The 3-D BYTE logo didn't give me much trouble. Oddly enough, the title text—which is usually easy—was the hardest part of the scene to construct. That's because Lightwave 3D doesn't do text per se. Instead, it has 3-D letter object files that you must individually load and place. Because of this, it took me far longer to build the scene in Lightwave 3D than with either the Macintosh or DOS platforms.

Once I had all the elements in the scene, the renderer's layout tool came into play. Lightwave 3D uses an interesting scheme that turns the mouse into a 3-D pointing device. It takes much getting used to, but when you get the knack of it, tooling around in 3-D space gets as easy as driving a car. Lightwave 3D is a *keyframe* animator. Simply stated, you arrange the objects in your scene the way you want them, and take a snapshot, or keyframe, of the scene. You then move objects around, taking keyframes as you go. At animation time, the renderer automatically smoothes the movement of objects between keyframes. So, to move a rectangle from the lower-left to the upper-right corner of the screen in just 1 second, you'd place the rectangle in the lower-left corner; create a keyframe at frame 0; move the rectangle to the upper-right corner; and create a keyframe at frame 30 (1 second). When the animation is rendered, the rectangle will glide diagonally across the screen.

Lightwave 3D is extremely powerful and capable of creating effects such as explosions, fog, and morphing (i.e., the gradual changing of one shape to another). In addition to animating the movement of objects (including the camera and lights), you can animate light color and intensity and several other attributes. These effects can be expensive—in terms of time—to experiment with, but thankfully, Lightwave 3D offers a variety of low-resolution rendering modes that let you rapidly generate test animations. You can quickly see the paths followed by moving objects in a scene using the wireframe preview feature. Lightwave 3D can either render animation frames to disk or record them directly to tape. As each frame is rendered, the frame number

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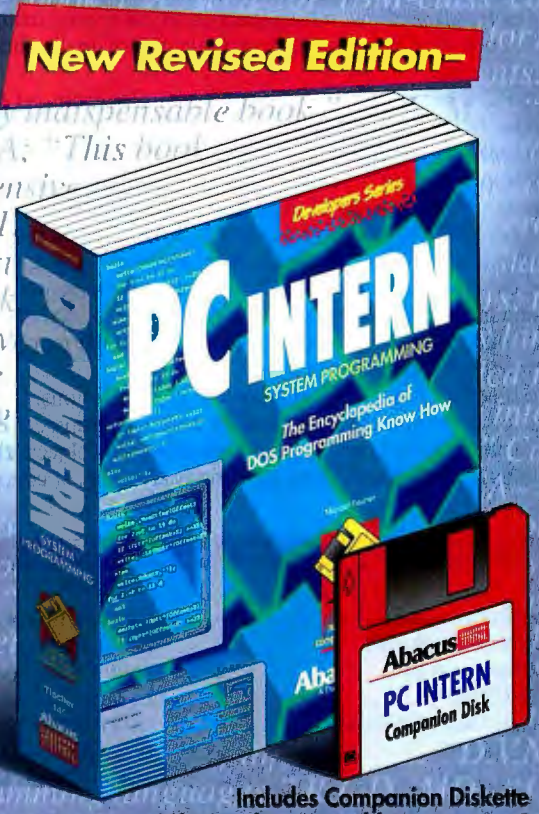
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and the rendering time appear on the Amiga's screen to help you gauge your progress.

Playing Favorites

The Mac has a wide variety of 3-D software available. I haven't picked my favorite yet, but I have the most experience with Electric Image's software package, ElectricImage, so I defer to it for most of my Mac animation work. It doesn't ray trace, but it does do image reflections (see below). It also includes Mr. Font, a tool that turns PostScript fonts into exquisite 3-D objects. ElectricImage can record directly to video using a number of animation controllers, including the Diaquest DQ-Animaq board used in the Multimedia Lab. It lets you animate just about any attribute, and the user interface is quite accommodating. My opening screen layout came together quickly in ElectricImage, and I found its materials preview, which lets you see an approximation of the color and shading properties you select on a small sphere, a great time-saver.

On the PC, I have a clear favorite: Topas, also from AT&T GSL. Topas is loaded with advantages, but I rank its fast rendering, integrated video-recorder control, rotoscoping, and reflections among my list of reasons for using Topas as much as I do. Rotoscoping is a wonderful thing: It maps moving video onto an object. Imagine that you have a model of a desk, with a framed picture of a dog standing in one corner. Partway through the scene, the picture comes to life, and the dog starts barking and running around the photo. You would use rotoscoping for that effect, and any video that you like could be mapped to the rectangle that represents the photo in the frame.

Unlike ElectricImage, Topas can create real reflections. ElectricImage lets you simulate reflections by mapping graphical image files to objects, but Topas scans the scene and lets objects carry reflections of each other. These reflections add time, of course, but it incurs nothing near the overhead of ray tracing.

Like RIO, Topas has its own scalable, manipulable fonts; it also has a straightforward combination modeler/renderer. Topas has the widest selection of preview modes, covering everything from real-time wireframe previews to stationary storyboards and animated color flipbooks that let you see light, shadow, and reflections without waiting for a recorded animation. Photo 3 shows the Topas storyboard for the BYTE Lab video introduction. Needless to say, I had no trouble getting my opening sequence animated through Topas.

Making the Grade

The toughest part of putting together a desktop video setup is choosing from among a vast number of quality products. Perhaps it's just chance, or maybe it's a testament to the quality of AT&T GSL products, but my favorite 2-D and 3-D packages happen to come from the same company and to run on the same platform. I'm neither an AT&T GSL nor a PC bigot—I couldn't do without my Amiga and Mac—but the combination of RIO and Topas has served me remarkably well. I got up to speed faster with these because of their simple interfaces and quality documentation, and I built up my creative skills more quickly because of their versatility. I also got more "wows" from people for the graphics and animations I constructed in these packages.

That's not to say I use the PC exclusively—hardly. In producing the BYTE Lab video, I have called on each of the Lab's systems for various parts of the job. You'll get a taste of that in next month's installment, which will wrap up this series with discussions of audio and editing. ■

Tom Yager is the director of BYTE's Multimedia Lab. He can be reached on BIX as "tyager" and on the Internet at tyager@bytepb.byte.com.

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One of the hottest topics in business and academia today is the OOPS (object-oriented programming system). The OOPS promises far-reaching improvements in how people design, develop, and maintain software by offering a long-term solution to problems and concerns that have existed since the dawn of software development: lack of code portability and reusability, code that is difficult to modify, long development cycles, and nonintuitive coding techniques.

An OOP language attacks these problems. It has three basic characteristics: It must be object-based, class-based, and capable of class inheritance. Many languages meet one or two of these criteria; far fewer meet all three. The stumbling block is usually inheritance. (For a primer of basic OOPS terminology, see table 1.)

Objects, being encapsulated units, are inherently portable (theoretically), while inheritance allows the reusability of OOPS code. It is easier to modify existing code, because objects don't interact except via messages; thus, a coding change in one object won't affect the operation of another object, as long as the respective methods remain intact. Code reusability reduces the time spent in development, and it makes software development more intuitive, because people naturally think in terms of objects rather than in terms of software algorithms.

Nirvana Has Weeds

An OOPS may sound like a virtual nirvana. The problem, however, comes in implementing such a system. Many companies hear about the benefits of an OOPS and commit large amounts of resources to it. Then they begin to realize that they have effectively imposed a new culture that is as foreign to today's programmers as trees are to the desert dweller. Specifically, the following issues come up time and time again.

• *Long learning curves.* An OOPS views the world in a unique way. It involves conceptualizing all the elements of a program—from subsystems to data—as objects. All communication between objects must be in the form of messages. This is not how non-OOPS programs are written today; in making the transition to OOPS, most programming staffs need complete retraining before they can use one.

• *Language dependencies.* Despite the conceptual portability of OOPS objects, in practice several dependencies still exist. Many OOPS languages are currently competing for dominance in the marketplace. Changing the OOPS implementation language is not a trivial undertaking. For example, C++ supports the concept of multiple inheritance, while Smalltalk



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PRIMER OF OOPS TERMINOLOGY

Table 1: *To be considered object-oriented, a programming language must have three basic characteristics: It must be object-based, class-based, and capable of class inheritance. Other characteristics often found in full-blown object-oriented languages are also listed.*

Term	Definition
Object	The data and access to it.
Class	A template used to create new objects. A class encompasses both data and methods.
Instance	One implementation of a class template. An object is an instance of a class, containing the data-interface implementation.
Instance variable	An object's data.
Encapsulation	The representation of an object and its data in discrete units. The isolation of one object (and its data) from other objects.
Method	An operation that performs data access.
Messages	The mechanisms by which objects communicate. A message lets methods send or receive data. The messages an object responds to form the basis of its protocol.
Protocol	The messages an object responds to.
Polymorphism	A fundamental concept of OOPS: the ability to send the same message to objects of different classes. These objects would all receive the same global message but could respond to it in varying ways; for example, a "+" message to an integer object means addition, whereas, to a string object, it might mean concatenation.
Inheritance	The ability to pass along class properties from one class to another. The resulting subclass has all the properties of its parent, which is the superclass.
Subclass	A class having all the properties of its parent class, as well as localized changes.
Superclass	A parent class of a subclass.
Multiple inheritance	The ability to inherit from multiple parents.
Object-oriented language	An object- and class-based programming language that is capable of class inheritance.

does not. Thus, the choice of language has major design ramifications.

• *Class determination.* A *class* is a template that you use to create new objects. Therefore, it's important to create the correct set of classes for a project. Unfortunately, class definition is more art than science. Although there are many predefined class hierarchies, you must usually go beyond them to create application-, industry-, or company-specific classes. Then in 6 months or a year, you may realize that the classes you established are not feasible. You may need to restructure the entire class hierarchy, totally devastating the original schedule.

• *Performance.* In a system where *everything* is an object and *all* interaction is via messages, messaging traffic has some obvious ramifications on performance. As technology advances, with microprocessor speed and power and memory size all increasing, the situation will greatly improve. But in today's environment, an OOPS application design that isn't tuned for performance probably won't be commercially feasible.

Ideally, there would be a way to address these problems effectively while still garnering the short- and long-term benefits of an OOPS development strategy. A methodology would exist that would be easy to learn (and intuitive), language independent, and simple to restructure and wouldn't create a performance drain on the system.

DDE MESSAGES

Table 2: *DDE is an open-ended, language-independent, message-based protocol that lets applications exchange data or commands in any mutually agreed-on format. The basic concept is that of a conversation between client and server, with the client being the initiator.*

Message	User	Description
INITIATE	Client	Begins a conversation.
INITIATEACK	Server	Acknowledges a conversation initiation.
REQUEST	Client	Requests data from a server.
DATA	Server	Sends data to a client.
EXECUTE	Client	Requests command execution.
ADVISE	Client	Establishes a hot link with a server. (The server agrees to notify the client when data changes.)
UNADVISE	Client	Terminates a server's hot link.
POKE	Client	Sends data to a server.
ACK	Client or server	A positive or negative acknowledgment of a previous request.
TERMINATE	Client or server	Terminates a conversation.

DDE Fills the Bill

In the OS/2 PM (Presentation Manager) and Windows operating environments, a message-based protocol allows applications to exchange information. DDE is open ended, allowing two applications to exchange data or commands in any mutually agreed-on format. The key is that the operating system supports the protocol. As long as the language you use supports the operating system's APIs for DDE, the protocol is language independent. If the operating environment supports DDE, applications using DDE need only interface with the operating system, not with each other. (Table 2 shows DDE's messaging protocol.)

The basic concept behind DDE is that of a conversation. There are two applications: a client and a server. The client initiates and controls the conversation flow, and the server responds to requests from the client. Applications often act as both client and server, carrying on multiple conversations simultaneously. As long as you understand the basic conversation verbs, you can establish interapplication communications at will.

The protocol delineates three established hierarchical layers—application, topic (one per conversation), and item—that control the subjects for DDE communications. The application

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OOPS/DDE MAPPING

Table 3: *The major concepts of an OOPS map directly to the DDE protocol. DDE can meet the requirements for an object-oriented language, although it doesn't have well-established structures for them. Although the DDE provides short-term advantages, it won't replace a full-blown object-oriented language in the long term.*

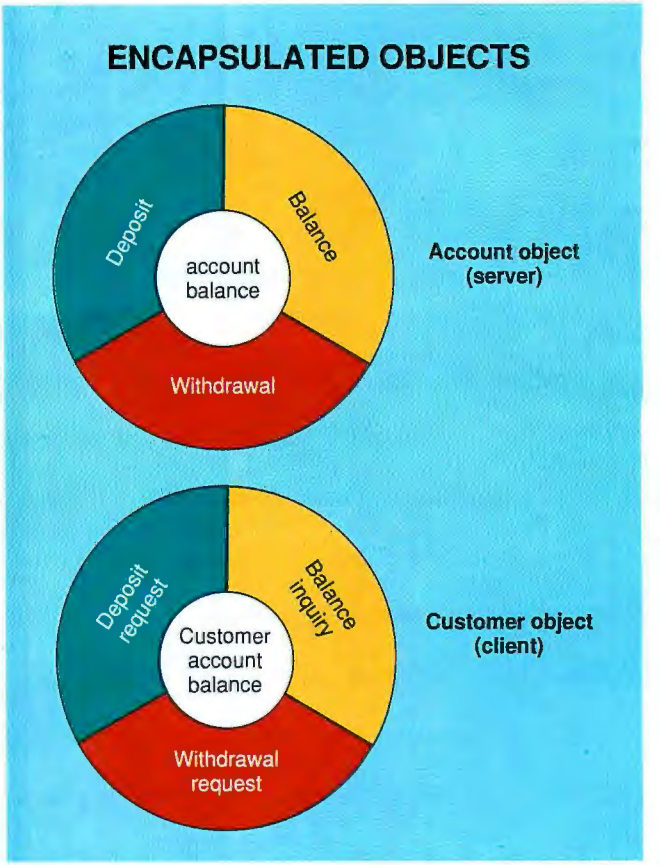
OOPS	DDE
Object	Application/topic pair.
Method	Item.
Class	The grouping of an application and a topic with items.
Inheritance	The establishment of identical groupings.
Multiple inheritance	The establishment of groupings with mixed topics and items from multiple applications.
Polymorphism	Identically named items for various applications.

layer is typically what one application would establish for itself. For example, a database-interface application (DBSERVE) might have its supported databases as its topics, and various SQL (Structured Query Language) commands (e.g., SELECT and RETRIEVE) as its items. Restructuring or altering the DDE interface is as simple as changing topics or items. In terms of performance, DDE messages don't carry any more overhead than other operating-system messages do.

By taking the major OOPS concepts and mapping them to the DDE protocol, you can establish a table of correlations (see table 3). In fact, a DDE implementation can qualify as an object-oriented language: It can be object- and class-based and capable of establishing class inheritance. In practice, this means that a system can take advantage of the OOPS structural methodology and still let people write in their favorite language, as long as the language supplies the appropriate DDE API.

In the PM and Windows environments, you would write the applications as processes and send the DDE messages between system windows, each window with its own handle. Since handles are a system resource, you could run out of them in a large DDE implementation (i.e., where many DDE processes are running at once). However, in a typical commercial environment, a 32-bit operating system would probably eliminate this concern.

One benefit of a DDE implementation is that it allows a staged migration between software development cultures and languages. For example, in a COBOL or C shop, programmers could write application processes in the familiar language but use DDE constructs to communicate and synchronize with other processes, creating a framework for an object-oriented system. If a small group of programmers wanted to program their application processes in Smalltalk or C++, they could do so independently. Thus, although only a few processes in the system would be written in a "true" OOPS language, the entire system would be an OOPS right from the start.



An example of an OOPS implementation through DDE is a bank transaction–processing system. Both client (Customer object) and server (Account object) are encapsulated objects (i.e., the client can only access the Account object through the server). The system uses DDE as the message protocol for all accesses.

BYTE ACTION SUMMARY

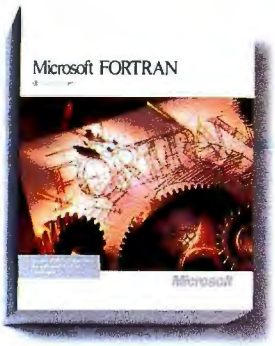
Many companies hear about the benefits of an OOPS and commit large amounts of resources to it. Then they realize that an OOPS is foreign to many of today's programmers. Using DDE as an enabler eases entry into the OOPS world, permitting management to move forward cautiously without betting the ranch.

Banking on OOPS and DDE

One common example of an OOPS implementation that can be implemented via DDE is a bank transaction–processing system (see the figure). Listings 1 and 2 show a server (an Account object) and a client (a Customer object), respectively, in DDE pseudocode. Both client and server are encapsulated objects (i.e., the client can only access the Account object through the server). The system generates the Customer object when someone tries to access the server using an on-line teller system, an ATM (automatic teller machine), or some other remote banking service.

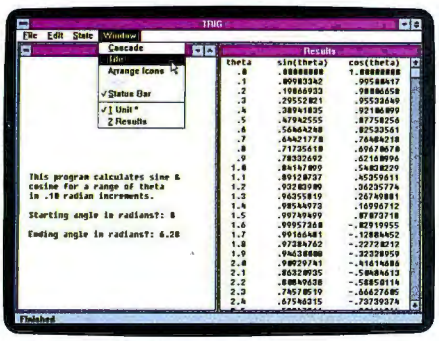
Regardless of the type of access, the system uses the same messaging protocol: DDE. A particular Customer object does not necessarily require all of the server's functionality; for example, an ATM transaction might not need the Deposit object.

Another example of a DDE OOPS implementation is a cooperative-processing data-retrieval system. You can implement the

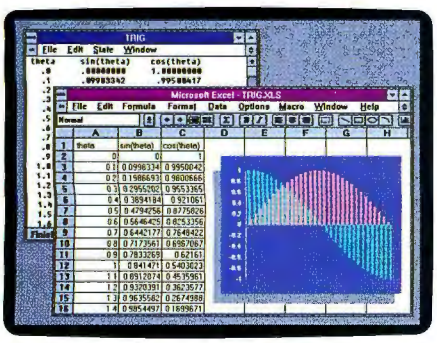


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Listing 1: *In this DDE pseudocode for the Account object,* `Bank Name` *and* `Account Number` *define the server object. Each specific account generates a different* `Application/Topic` *pair.* `Item` *lists methods for the Account object. Both client (see listing 2) and server are encapsulated objects.*

```
Begin Definitions
  Application = 'Bank Name'
  Topic = 'Account Number'
  Item = 'Balance', 'Deposit', 'Withdrawal'
End

Initialization

Do Forever
  Receive Message

  Case 'Initiate'          // 'Initiate' DDE message
    Check application ('Bank Name') and topic
            ('Account Number')
    If available
      Send 'ack'
    Else
      Send negative 'ack'
    Endif

  Case 'Request'          // 'Request' DDE message

    Case 'Balance'
      If valid client
        Send balance data for account
      Else
        Send negative 'ack'
      Endif

    Case 'Deposit'
      If valid client
        Update balance data for account
        Send 'ack'
      Else
        Send negative 'ack'
      Endif

    Case 'Withdrawal'
      If valid client
        Validate withdrawal amount
        If ok
          Update balance data for account
          Send 'ack'
        Else
          Send negative 'ack'
        Endif
      Else
        Send negative 'ack'
      Endif

  Case 'Terminate'        // 'Terminate' DDE message
    If valid client
      Send 'terminate'
    Endif

Enddo
```

system on a workstation where it interacts with up to five mainframe sessions, sending or receiving data, as well as directly with the workstation user. The workstation has local data and file storage and can write reports, chart graphs, and send data to a spreadsheet.

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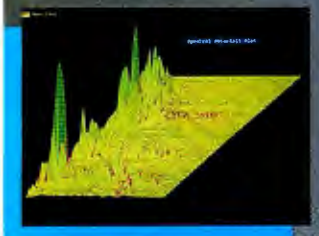
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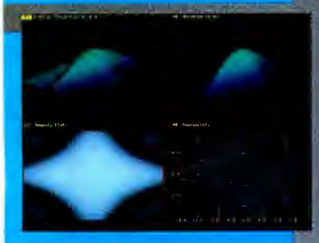
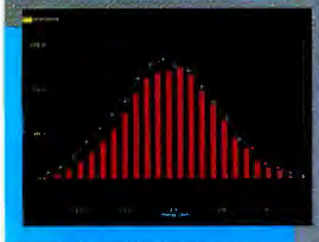
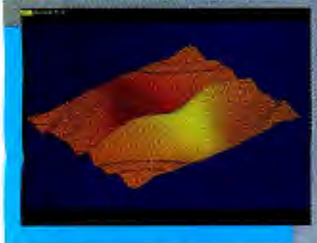


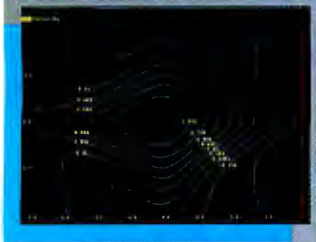
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Listing 2: *In this DDE pseudocode for the Customer object,* `Application` *and* `Topic` *still refer to the server object (see listing 1). However,* `Item` *shows the methods for the Customer object, which is generated when you try to access an account using an ATM or other on-line banking service.*

```
Begin Definitions
  Application = 'Bank Name'
  Topic = 'Account Number'
  Item = 'Balance Inquiry', 'Deposit Request',
         'Withdrawal Request'
End

// Search via Initiate message for server object.
Poll for server ('Bank Name', 'Account Number')

Do Forever
  Receive Message

  Case 'Balance Inquiry'    // User-generated message
    Make inquiry with request message, item =
           'Balance'
    If negative 'ack'
      Display error message
    Else
      Report account balance
    Endif

  Case 'Deposit Request'      // User-generated
         message
    Send deposit request with request message, item =
         'Deposit'
    If 'ack'
      Display ok message
    Else
      Display error message
    Endif

  Case 'Withdrawal Request'   // User-generated
         message
    Send withdrawal request with request message,
         item ='Withdrawal'
    If 'ack'
      Dispense money
    Else
      Display error message
    Endif

  Case 'Terminate'        // 'Terminate' DDE message
    If valid conversation
      Send 'terminate'
    Endif

Enddo
```

production system would, in all probability, also contain an additional process for error handling and/or system diagnostics, and it might well take more than one process to implement any of these services. In the OS/2 environment, all the processes would probably involve multiple threads of program execution. None of these considerations, however, has a direct impact on the architectural framework of the DDE environment.

All processes can have one application level, since all are part of a single production application. The additional considerations then become what topics or items to have and whether each process should function as a client, a server, or both. The following is a description of each process.

• *Communications server.* This process acts as the gateway, or *router*, to the mainframe server processes. It determines which mainframe the data resides on (or should be routed to) and

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forwards the messages appropriately. Thus, the data source and destination are transparent at the workstation level. The communications server process needs to act as both client (to the mainframe servers and the applications router) and server (to the process sending or receiving data). Its topics and items would probably be similar to those on the mainframe servers (and most likely originally inherited from the communications server).

- *Database server.* This process handles data stored locally at the workstation. It is a resource controller, ensuring that the data update and retrieval for up to five mainframe sessions and an interactive terminal do not corrupt the information store and that errors in data transmission result in controlled rollback. This process acts only as a server and deals with data storage and retrieval, just as the communications server does, so it might inherit at least some of the communications server's topics and items. You can add or remove topics and items as required.
- *File server.* For convenience, local workstation files hold reports, data, graphs, and other user information. The file-server process controls file storage and retrieval and acts as a server. It probably has unique topics and items; thus, it doesn't inherit them.
- *Mainframe servers.* These processes deal directly with the mainframe sessions and often interact only with the communications server, thus acting only as servers. You can enable them to function with the database server as well.
- *External applications server.* This process sends data to a spreadsheet. You need a spreadsheet that understands DDE; the spreadsheet definitions largely determine the topics and items that the external applications server uses. The rest of the topics communicate with the client process.
- *Service provider.* This process functions as a server, handling requests from its clients for charts, graphs, reports, and other summary information. The service provider has unique topics and items.
- *Main applications router.* This process interacts with the user and accepts data input. It is a client for most of the other (server) processes.

Note that this outline does not contain a direct language dependency. A systems architect specifies the I/O for each process via DDE topics and items. As long as all programmers adhere to them, developmental activities center around the individual processes, leading to more manageable debugging scenarios. You can readily carry out systems tests using test drivers and other "stub" modules; this method allows rapid prototyping, since you can better isolate the problems and create stub modules to test various parts of the system.

Paving the Way

Using DDE as an OOPS enabler does not do away with the requirement for an object-oriented development language. DDE is not a programming language and does not have well-defined structures in place for establishing classes and inheritance. However, DDE allows you to apply existing technology and programming expertise.

The DDE approach eases entry into the OOPS world in a controlled manner, permitting management to move forward cautiously, rather than precipitously betting the ranch. DDE does the job today while paving the way for tomorrow. ■

Kevin Kornfeld is a senior marketing support representative for IBM's Software Vendor Systems Center (Roanoke, TX), and Kevin Gilhooly is a senior software engineer for the Computer Task Group. You can reach them on BIX c/o "editors" or on Internet at kevink@dalhqic2.vnet.ibm.com and kgilhooly@mcimail.com, respectively.

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WINDOWS, WINDOWS, EVERYWHERE

It's hardly news that almost everyone—with one or two notable exceptions—is jumping on the Microsoft Windows bandwagon. IDC (International Data Corp.) predicts that this year more than two-thirds of PC operating-system sales will be Windows, increasing to 77 percent in 1993. Microsoft says that it has sold 10 million copies of Windows so far.

Sales of Windows applications are setting records, too. The Software Publishing Association reports that, last year, sales of Windows applications increased by 196 percent over 1990; they were up an astounding 228 percent in the fourth quarter. Compare that to a 37 percent jump in sales of Macintosh applications and only a 6 percent rise in DOS application sales.

Each day brings announcements of new Windows programs. Some of these programs are just hastily conceived ports to Windows that add nothing more than a new interface and colorful icons and fail to significantly advance the application's ease of use or functionality.

Such window-dressing is becoming rarer, however, as new programs that were simply impossible to implement with a command-line interface are easy to learn and a joy to use when coupled with a GUI. As our special report on Windows points out, a user-friendly PC executive information system would be unachievable without a GUI. The same holds true for PC picture-editing applications that used to reside exclusively on Macs. And the pen extensions built into Windows will surely provide the foundation for a new class of applications.

Obviously, Windows 3.1 is not the end-all of GUIs. And, of course, Windows applications are not for everyone. But all it takes is seeing that new Windows application that you can't live without, and suddenly, you're hooked. ■

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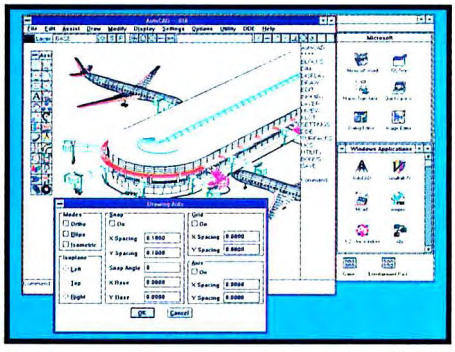
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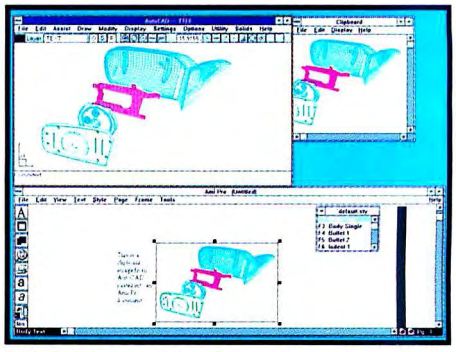
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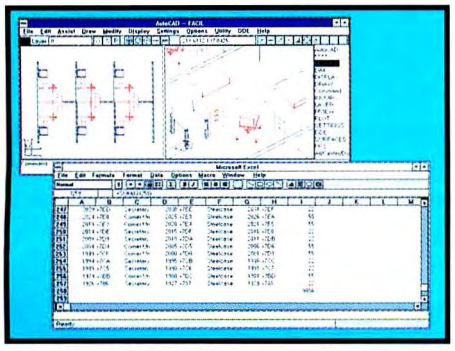
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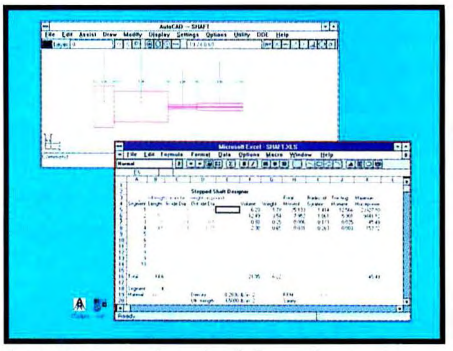
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JON UDELL

WINDOWS MEETS THE PEN

Write 2000 words by hand? Never again! But the imminent marriage of the computer and the pen does bring many advantages.



I've often thought about my fifth-grade teacher, Mrs. Cloud, who vainly fought to improve my handwriting. Thanks to the typewriter—and then the computer—the skills she cherished no longer seemed to matter. The keyboard gave me blazing speed and total legibility; top that, Mrs. Cloud! Well, perhaps she'll have the last laugh. The imminent marriage of the computer and the pen brings us full circle.

Will pen-based systems transform the desktop computing landscape, or will they define a new form of mobile, ubiquitous computing? Both, I suspect. We want computers to melt into the woodwork, to weave themselves into the very fabric of our lives. That means they'll have to embrace the most basic tools of civilization—including the pen.

Whether pen computing demands revolutionary, or merely evolutionary, operating-system support is a topic of much debate at the moment. Go Corp.'s PenPoint takes the *revolutionary* tack. Designed from scratch to host an emerging breed of "pen-centric" applications, PenPoint breaks ground in a number of areas (see "The Point of the Pen," February 1991 BYTE).

Microsoft, in contrast, has taken the *evolutionary* approach. The Windows 3.1 SDK (Software Development Kit) ships with the tools, libraries, and drivers that transform Windows 3.1 into a pen-based operating system called Windows for Pen Computing (or Windows for Pens, for short). Manufacturers of pen computers (e.g., NCR, Grid, and Samsung) and pen applications (e.g., Slate) see merit in both approaches and are trying to support both PenPoint and Windows for Pens.

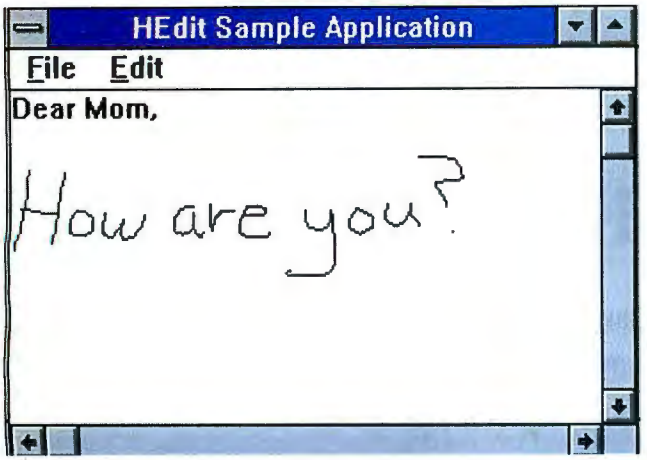
You can test-drive Windows for Pens using nothing more than an ordinary desktop or notebook system and a mouse. For real development work, however, you'll need at least a digitizing tablet—preferably one with an integrated display—or, better yet, a standalone pen machine like the NCR 3125.

Installing the pen extensions barely disturbs a preexisting Windows 3.1 setup. New mouse and display drivers appear in SYSTEM.INI, a set of pen-related tools show up on the Control Panel, and an application called PenPalette lands in the start-up folder. In the SYSTEM directory alongside the multimedia extensions, you'll find new DLLs that empower Windows to recognize handwriting and gestures. There's also a pen driver that acts as traffic cop, routing pen data to Windows as mouse events or to the pen subsystem as strokes, depending on context.

Thanks to PenPalette, unmodified Windows 3.x applications can make immediate use of the pen. You can write directly in dialog boxes and in pen-oblivious text editors like the SDK's EditFile (see screen 1). How? PenPalette watches for any window that creates an `Edit` control—more specifically, an `Edit` control that uses the standard I-beam cursor. PenPalette then converts the `Edit` control into a `HEdit` (for "handwriting edit") control, preempts its input, sends pen strokes to the recognizer, gathers up the resulting characters, and pumps them into the window as keystroke events.

The same mechanism supports gestures, which come in two flavors. *Core gestures* (see screen 2) invoke basic operations, like Copy, Cut, and Paste. An especially powerful core gesture is Delete Words, a back-and-forth stroke that simultaneously defines

ILLUSTRATION: NICKOLAI PUNIN © 1992



Screen 1: *The PenPalette application converts the Edit control into an HEdit control, routes pen input through the handwriting recognizer, and feeds keystrokes into pen-oblivious applications.*

and cuts. Also available are *circle gestures*, which you draw by encircling letters of the alphabet. These are systemwide or application-specific macros that expand into user-defined sequences of keystrokes.

You Train It; It Trains You

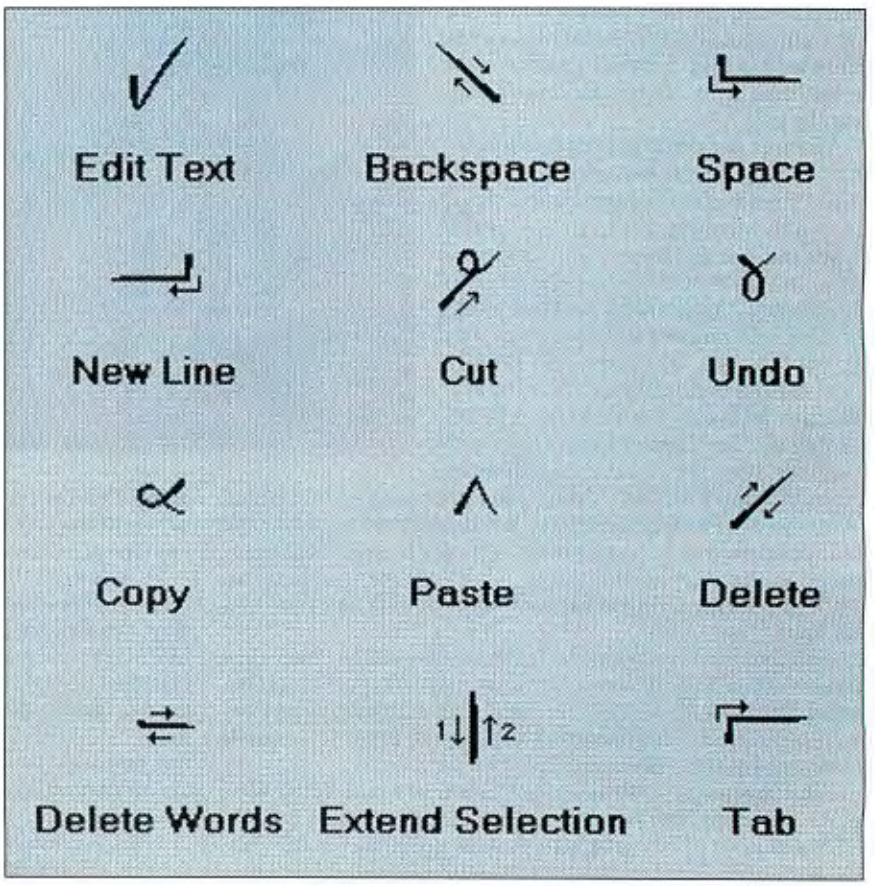
Recognition improves dramatically during your first few hours of interaction with the system. An introductory tutorial on gestures helps get you started. It demonstrates the gestures, invites you to reproduce them, and offers useful feedback, such as "Your gesture was too far to the right." Once you begin writing in earnest, training becomes an intricate duet—you train the system, and it trains you. Any time the recognizer errs, you can launch the Trainer.

Screen 3 illustrates two kinds of errors that you can use the Trainer to correct. The first *r* in *Margaret* was not recognized at all; the second *a* was misrecognized as *u*. In both cases, you can tell the Trainer to assign the meanings you intended—but should you? In this case, I'd approve the *r* but not the *a*; the latter is just too sloppy. To call that shape an *a* would invite confusion with *u*. Here, I'd allow the Trainer to train me to write *a* more carefully.

The Trainer can access the database of character forms by meaning (i.e., character or gesture) or by shape. In screen 4, I used the meaning *g* as the search key and reviewed the set of shapes mapped to that character. In screen 5, I used a *g* shape as a search key and retrieved the set of similar shapes. Some of these meant *g*, and others meant *y*; the difference hinges on the degree of openness or closure. I fine-tuned the discrimination between the two by drawing shapes that tested the boundary conditions and adjusting meanings until I was satisfied.

If you inadvertently assign multiple meanings to a shape (see screen 6), you'll want to resolve the ambiguity. In this case, I decided to preserve the meaning *S* and adjusted its size accordingly (see screen 7). Note the cursive appearance of some of the *s* samples in screen 6. Although the recognizer does not support connected cursive handwriting, it handled broken cursive very nicely once I trained it to do so. You can also train the system to recognize pairs or triplets of characters (see screen 8).

The system remembers all your training in a file that you can move to another Windows for Pens machine. In addition, it



Screen 2: *The immediacy of gestural commands like Copy and Paste is striking.*

BYTE ACTION SUMMARY

The first generation of pen-enabled computers will find markets very different from those today's desktop systems serve. Utility-meter readers, traveling salespeople, and other mobile information workers are the targets of the initial wave of pen-centric applications. It wouldn't be surprising, though, if pen awareness starts infiltrating the mainstream world of desktop and notebook computing. The ability to define and execute in a single gesture is particularly compelling.



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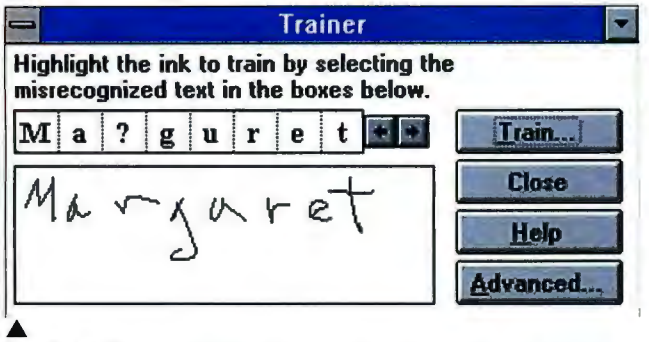
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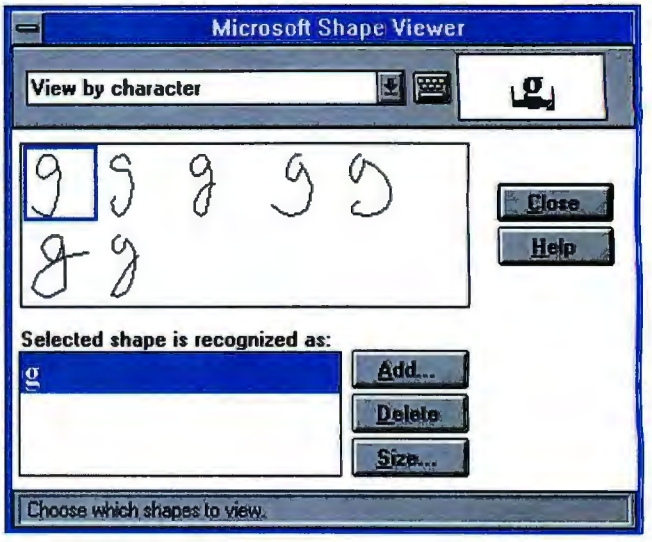
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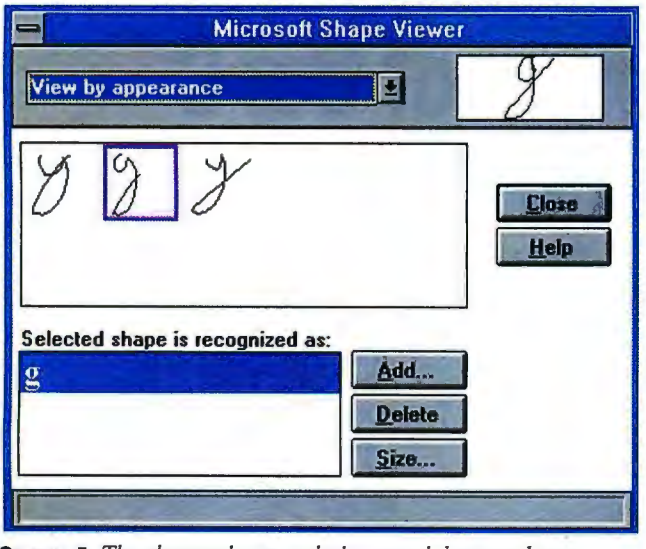
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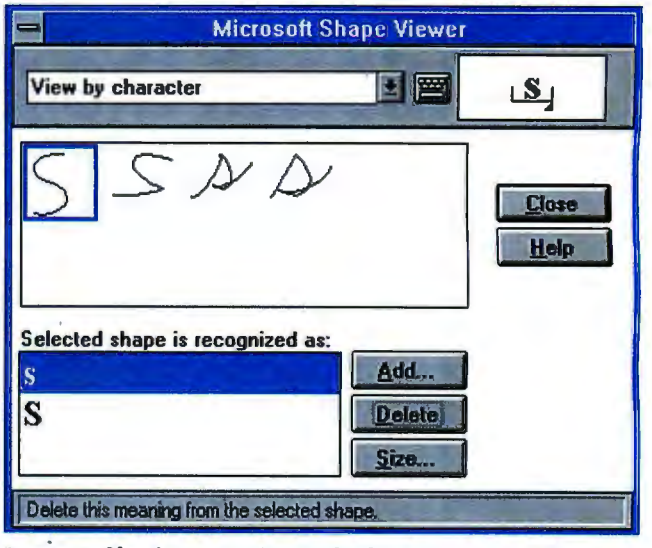
Screen 3: *You can tell the Trainer that you meant the second* a *as a* u, *but is that fair?*



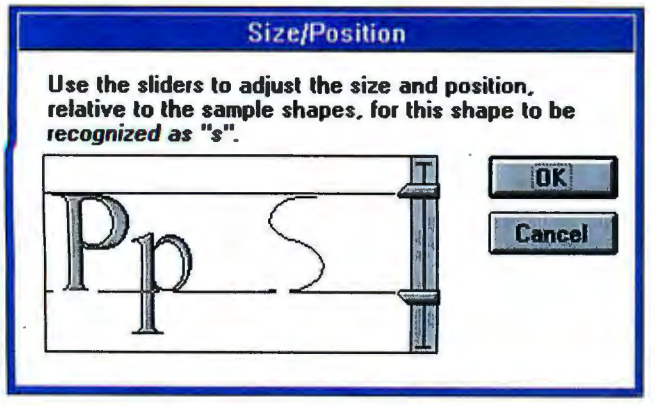
Screen 4: *The database stores a variety of samples of my* g. *The Trainer can access a database of character forms by meaning (i.e., character or gesture) or by shape.*



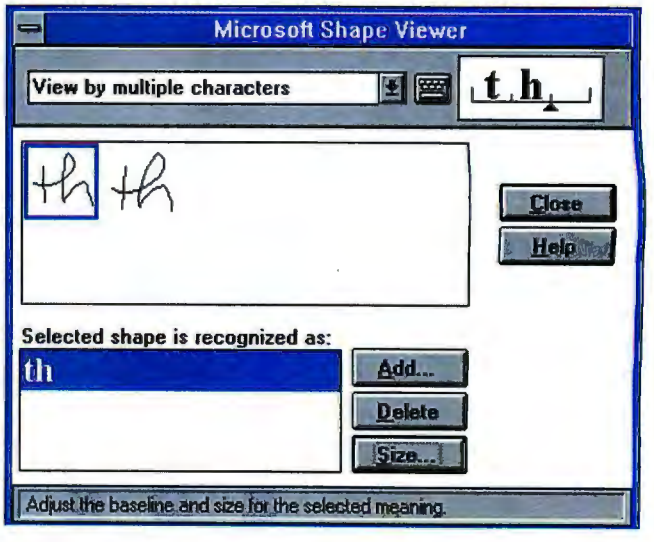
Screen 5: *The shapes that match the search key can have different meanings. Here, the other two shapes mean* y.



Screen 6: *If a shape acquires multiple meanings, you'll need to remove the ambiguity.*

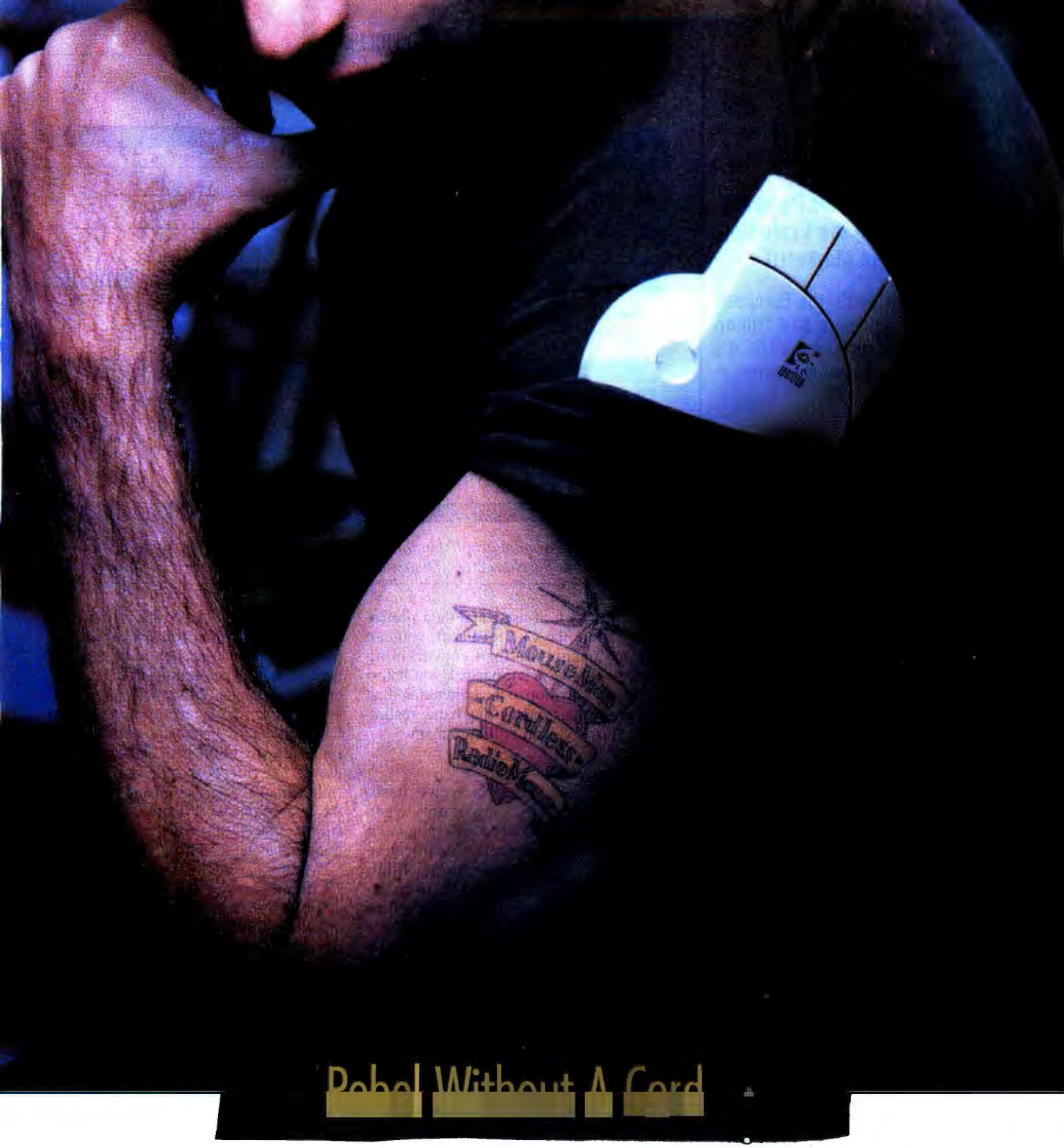


Screen 7: *Specifying a shape's size and its position relative to a baseline helps resolve ambiguity.*



Screen 8: *Training the system to accept pairs or triplets of characters allows for a bit of connected cursive writing.*

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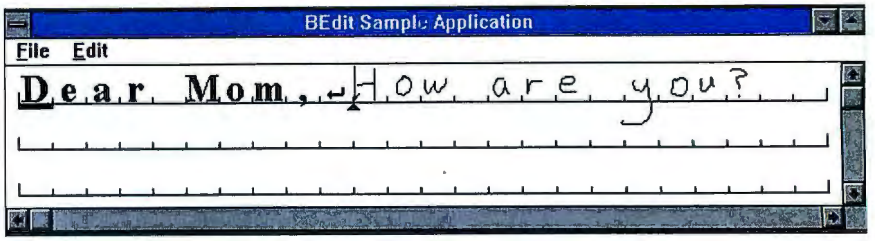


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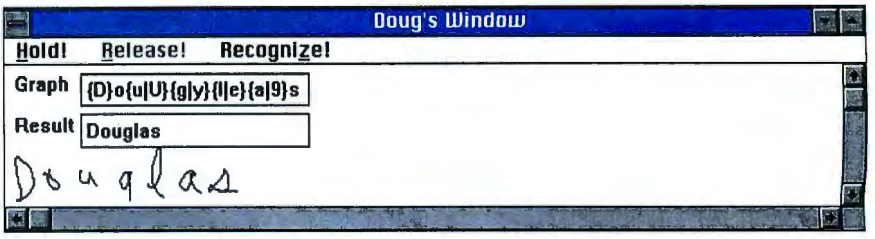
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Screen 9: *Writing in the boxes feels awkward but improves recognition.*



Screen 10: *The symbol graph that the recognizer produces often includes alternative interpretations for characters. Dictionaries help the system arrive at a final result.*

maintains a list of users and their preferences. From the Control Panel, you can tell my machine to load your training database. If you're left-handed, you'll also want menus to drop to the right rather than the left so that your writing hand, resting on the display, won't obscure them.

Pen Awareness

An unmodified application receives handwriting and gesture support only when PenPalette is active. By registering itself with the pen subsystem, an application frees itself from this dependence. Minimally, that involves testing for the presence of the pen subsystem and then calling `RegisterPenApp`. The application's `Edit` controls become `HEdit` controls that handle recognition. This looks like the same result you get with PenPalette, but the behavior differs in a subtle and interesting way.

Consider the EditFile application in the Windows 3.1 SDK. Using PenPalette's support, the program reacts to the Copy gesture with the message "Command not implemented." That's because PenPalette converts the gesture into an accelerator key, Control-Insert, which the application sees as a menu selection, IDM_COPY, that it does not implement in this case. When I registered the application with the pen subsystem, however, gestures like Copy and Paste simply worked.

These behaviors come "for free" with pen awareness, and they are immediate, requiring no interaction with the menu system. While you generally have to add code to achieve pen awareness, it's interesting to note that that's not always so.

An application that is minimally pen-aware is also, not surprisingly, minimally useful in the absence of a keyboard. Applications that target pen-only machines need to be truly pen-centric, and that means cracking open the Windows for Pens API.

Since handwriting recognition isn't perfect, pen-centric applications strive to optimize the use of the pen. One option is to use `BEdit` (for "boxed edit"; see screen 9) rather than `HEdit` controls. Writing in the character boxes is about as much fun as filling out a credit-card application, but it does enhance recognition.

In many cases, it's useful to constrain the allowable inputs to `HEdit` or `BEdit` controls—a feat that entails manipulating Windows for Pens' central data structure, the RC (recognition context). One of the slots in an RC specifies sets of allowable characters, or ALCs (alphabet codes). Here is how you'd set a field to recognize only uppercase letters, digits, or gestures:

```
RC rc;
rc.alc = ALC_UCALPHA |
  ALC_NUMERIC | ALC_GESTURE
```

The special constant ALC_USEBITMAP instructs the recognizer to scan a 32-byte-long bit field that maps the 256 ANSI characters. Only the characters corresponding to the bits that you've set will be recognized.

Dictionaries

The recognizer's raw output isn't simply a string of characters, but rather a *symbol graph* (see screen 10) that can encode several alternative meanings for each input shape. The system refers to a *dictionary* to help select the likeliest interpretation.

continued



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A dictionary is a DLL that exports the standard entry point `DictionaryProc` and responds to some or all of a set of standard requests.

Windows for Pens ships with two dictionaries. The main dictionary, always consulted unless an application specifies otherwise, uses a standard English lexicon (Soft-Art's spelling checker) to help interpret symbol graphs. Applications can also enlist the help of the user dictionary, which compares symbol graphs to lists of words contained in plain ASCII text files.

The pen makes a better mouse in some ways.

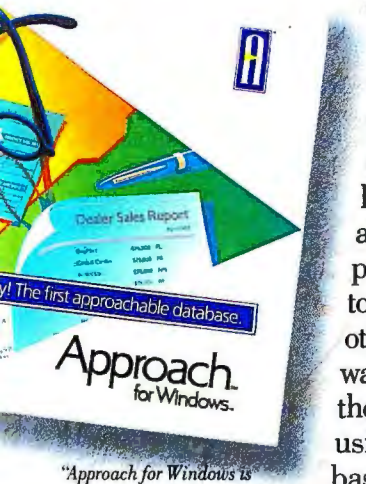
Both of these dictionaries operate conservatively; they don't force interpretations to match dictionary entries. However, it's possible and often useful to build a custom dictionary that completes partial input. The Windows for Pens SDK includes a sample expense-form application that works this way. As soon as the recognizer returns an *H* in an expense-item field, the custom dictionary completes the word *Hotel*.

To enable the user dictionary or a custom dictionary in a given recognition context, you fill an RC slot with a pointer to its `DictionaryProc`. To configure it, you call the `DictionaryProc` with requests like DIRQ_OPEN (open a word list), DIRQ_SETWORDLISTS (set the current word list), or DIRQ_ADD (add a word to a word list). To enable completion, you specify the RC option RCO_SUGGEST, which in turn invokes the dictionary's DIRQ_SUGGEST method.

Although dictionaries condition the interpretation of a symbol graph, applications can always override that interpretation by inspecting the symbol graph directly. It's a bit more work, though. Instead of relying on the automatic recognition that the `HEdit` and `BEdit` controls provide, the application must call the recognizer directly.

One approach is to call `IsPenEvent` on receipt of a WM_LBUTTONDOWN message (i.e., a left-button mouse-click). If this function returns true, the user has started to write. The application initializes an

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BEST OF COMDEX Spring '92 BYTE

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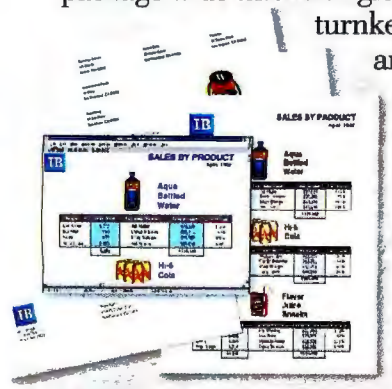
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Circle 311 on Inquiry Card.

RC and calls `Recognize`. When the recognizer finishes, it sends a WM_ RCRESULT message, which carries a pointer to an RCRESULT structure that contains the recognized characters, the symbol graph, and the corresponding ink.

Working with Ink

If you're taking notes rapidly and don't have time to correct your writing, you might want to defer recognition until a more convenient time. And of course, if you are signing your name, you don't want recognition to occur at all. Raw pen strokes that you can store, copy, or replay—a special data type called *ink*—play a critical role in pen computing.

Consider the notepad next to your telephone. Its pages say more than the alphanumeric characters you've written there; diagrams, arrows, and other visual cues subtly enhance the information content. Emerging pen-centric applications support these kinds of annotations by enabling the collection and manipulation of ink.

To defer recognition in a `HEdit` or `BEdit` control, you need only send its window the HE_SETINKMODE message. The complementary message HE_STOPINKMODE activates recognition again. At a lower level, you can use the ink handle included in an RCRESULT structure to duplicate, redisplay, resize, or enumerate a set of pen strokes.

Alternative Recognizers

Recognizers are replaceable components in Windows for Pens. Since the default recognizer is a DLL, you can just replace it with another DLL that conforms to the standard protocols for collecting pen data, forming a symbol graph, utilizing dictionaries, and responding to training requests. Nestor's NestorWriter is one example of an alternative recognizer now being licensed to manufacturers of pen-based systems. (It can also replace PenPoint's recognizer.)

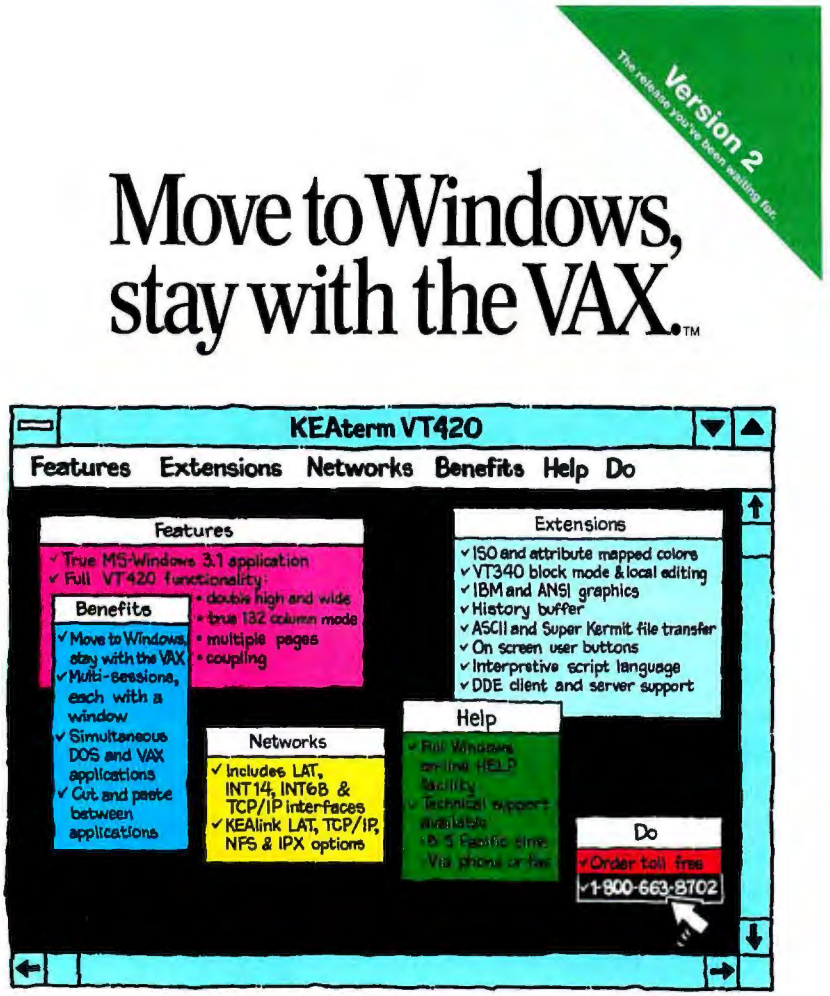
While developers of pen applications aren't going to build full-blown handwriting recognizers, they're likely to create auxiliary recognizers that handle application-specific shapes. For example, Windows for Pens comes with a shape recognizer applications can use to convert wobbly hand-drawn lines, ellipses, and rectangles into clean GDI (Graphics Device Interface)-rendered lines, ellipses, and rectangles. The pen SDK also has a skeleton for building a special-purpose recognizer.

The Power of the Pen

The first generation of pen-enabled computers—at least 15 companies say they'll have units for sale by this fall—will find markets very different from those today's desktop systems serve. Utility-meter readers, traveling salespeople, and other mobile information workers are the targets of the initial wave of pen-centric applications. Clearly, Windows for Pens deserves its fair share of that market. The pen extensions exhibit a clean, modular design and benefit greatly from the existing base of experience with Windows programming.

I wouldn't be surprised, though, if pen awareness starts infiltrating the mainstream world of desktop and notebook computing. I hope I'll never again have to write 2000 words by hand—either on paper or on a pen computer. But the pen does make a better mouse in some ways. The ability to define and execute in a single gesture is particularly compelling. Mainstream Windows programs could learn some useful tricks from their pen-centric cousins. ■

Jon Udell is a BYTE senior technical editor at large. You can reach him on BIX as "judell."



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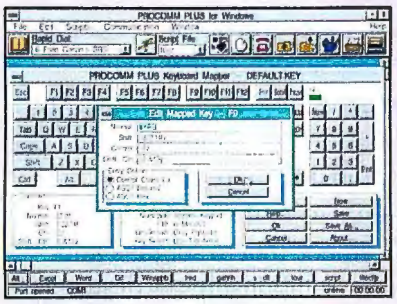


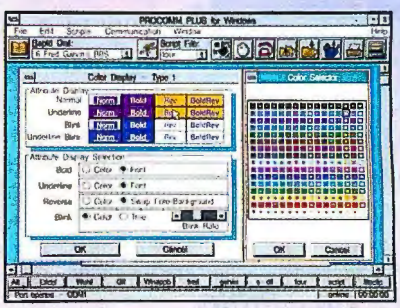
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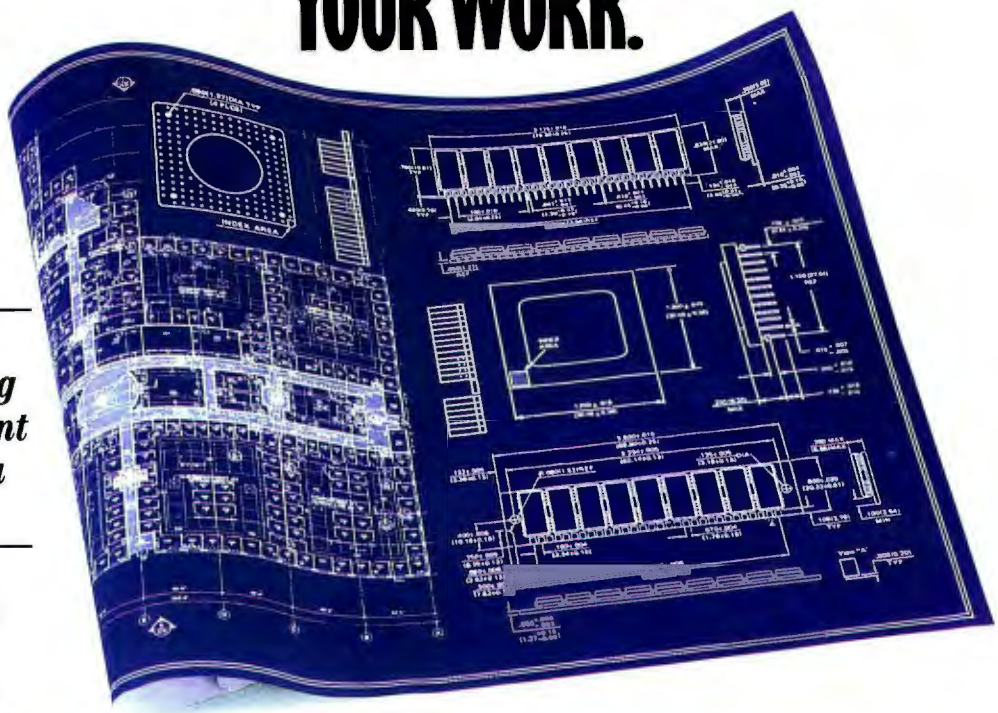
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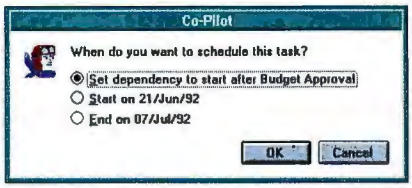
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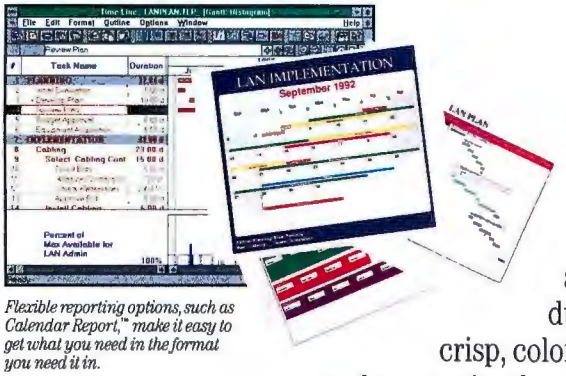
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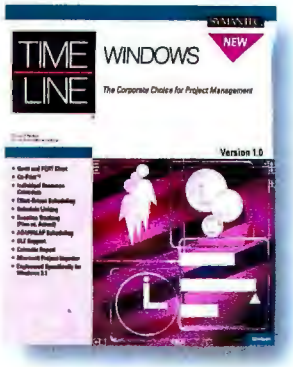
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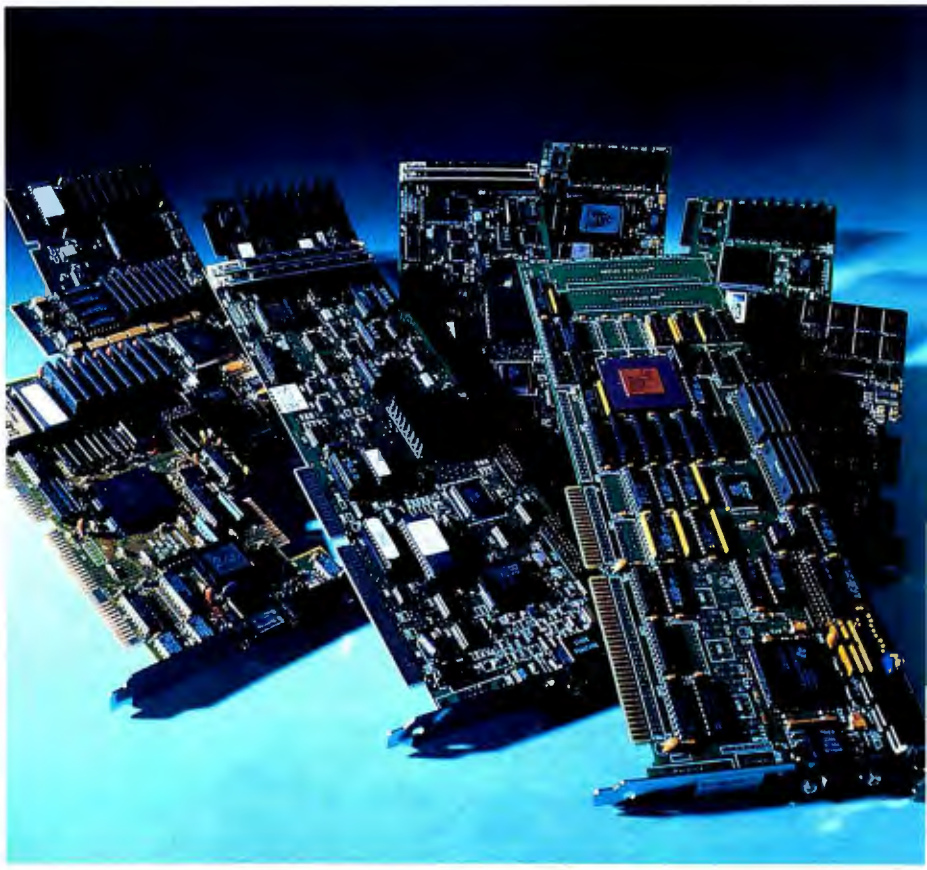
GREG LOVERIA

FLYING WINDOWS

Ten accelerator adapters offer the least expensive route to date for transforming Windows into a blisteringly fast and productive environment

If you're like me, your daily computing needs alternate between DOS and Windows applications. When time is of the essence, you still rush to your DOS applications, such as WordPerfect and Lotus 1-2-3, to compose documents or to compute spreadsheet data. But when you have more time, Windows has an appeal that's hard to resist.

Time, then, is the driving force behind your choice, and products that improve the time restraints of Windows are of great interest. Recently, I examined 10 speed-enhancement adapters that can transform the tediously slow Windows desktop into a blisteringly fast and productive environment.



Moving Right Along

In some instances, it actually felt as if my 486/25 system had accelerated to 150 MHz. For a relatively small investment ($299 to $995), these accelerator adapters offer the least expensive route to date for enhancing PC speed and Windows productivity (see the text box "Speeding Windows" on page 174).

Accelerating Windows applications with alternative display-adapter hardware is not a new concept (see "Tweaking Windows: New Adapters Boost Speed and Clarity" in the January BYTE). However, with so many enhancement adapters entering the marketplace, as well as emerging Super VGA display resolutions above 1024 by 768 pixels, BYTE wanted to take another look at them.

My goals were to reexamine objectively the claims of Windows display accelerator vendors and to provide a subjective critique of the installation process and documentation quality. Because of the number of boards I wanted to test and the deadline I was under, I placed prime importance on the ease with which I could reconfigure an existing Windows installation to include a speed-enhancement adapter.

The 10 accelerators I examined (see the table) all used 16-bit ISA bus slots and shipped with 1 MB of on-board VRAM (video RAM), except for the two 2-MB Hercules TIGA (Texas Instruments Graphics Architecture)–based boards. I tested all of them at varying resolutions and refresh rates. (The combination of graphics data and an ISA bus tends to create a bottleneck; one approach to overcoming it is outlined in the text box "Local Bus Video" on page 178.) I performed my objective Windows-applications and display-speed tests with Windows 3.0 at the 1024-by 768-pixel resolution with 8-bit color (i.e., 256 colors) in either interlaced or noninterlaced refresh rates, depending on the board's requirements (see figure 1).



Hercules Graphics Station Gold series

Put a TIGA in Your Tank

The Hercules Graphics Station Gold series of full-length adapters, based on the TMS34010 TIGA coprocessor, ships in four configurations. The Gold 16 supports output

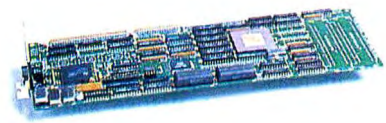
of 32,768 colors (the 1-MB version costs $495; the 2-MB version, $695), and the Gold 24 supports 16.7 million colors (1 MB for $595, 2 MB for $795). The adapters support Windows resolutions of up to 1024 by 768 pixels by 8 bits, and all four adapters ship with ImagePrep software and Autodesk product drivers. I tested a Gold 16+2 and a Gold 24+2, both 2-MB versions.

The Gold cards and their software are easy to install. Both of them connect to existing Super VGA adapters (in this instance, my 1-MB SpeedStar) via feature-bus connections that implement VGA pass-through. This allows a Super VGA adapter's VGA output to be routed through the Gold card; you then simply move your monitor's input cable to the 15-pin D-shell VGA out connector on the Gold card. The procedure is uncomplicated and thoroughly explained in Hercules's excellent documentation. Next, you install the TIGA communications software and then select the monitor-resolution mode.

From the Windows SETUP utility, you copy fonts and HERCULES.INI files from a Windows-driver floppy disk into the WINDOWS\SYSTEM subdirectory. With the Gold adapters, the display is beautifully crisp, clean, and sharp inside Windows at 1024- by 768-pixel resolution with 256 colors.

Compared to most S3-based adapters, however, the Gold cards fared badly in the WordPerfect arena but showed substantial speed gains with both PhotoStyler and CorelDraw. In some instances, they proved faster with these programs than some of the S3-based accelerators.

As an animator and imaging specialist, I liked these cards. Rather than viewing them as just Windows accelerators, I tested them at 16- and 24-bit color depths at 512- by 480-pixel resolution. Using the supplied drivers for 3D Studio, you can display full 16- and 24-bit color renders on standard VGA monitors. Also, Autodesk's Animator Pro and PixoArts' true-color image-manipulation program, PixoFoto, functioned perfectly. If your Windows and imaging needs follow along these lines, the Hercules Gold adapters are an excellent value.



WinSprint 200

Artist Graphics' WinSprint 200 is a 1-MB full-length TMS34020-based TIGA coprocessor adapter that supports Windows resolutions of up to 1024 by 768 pixels in 16 or 256 colors. At $995, the WinSprint 200 was the most expensive accelerator I looked at.

Like the Hercules boards, the WinSprint 200 uses VGA pass-through and TIGA communications software links. Board and software installation, however, are somewhat complex. On my Zeos EISA system, I had to reconfigure slots for memory and I/O base-address selection. (On ISA-based systems, this isn't necessary.)

The TIGA software installation is lengthy, and I had problems setting the environment variables. Artist Graphics' excellent technical support stepped me rapidly through both TIGA and Windows-driver installations. The WinSprint 200 documentation is good; the manual covers the associated settings; I had just overlooked them.

At a 1024- by 768-pixel resolution and 72-Hz refresh rate, both the Optiquest and Relisys 14-inch monitors' 65-MHz video bandwidths proved too small for the WinSprint 200's 75-MHz output clock. The board worked fine with Nanao's 20-inch FlexScan 9500 multifrequency monitor, which accepts video bandwidths of up to 120 MHz. Artist Graphics says that its boards soon will have video-bandwidth rates that work with all monitors.

The problems I experienced, however, proved well worth the effort required to overcome them. The WinSprint 200 makes Windows fly, and in most tests, it considerably outpaced many S3-based cards. Within Windows, you can change virtual screen sizes to 2048 by 768 pixels or 1536 by 1024 pixels using WinSprint 200's 16-color Panorama utility. For wide Windows applications, like Excel spreadsheets, simply dragging the cursor left or right pans the display screen smoothly.

Although it costs almost twice as much as the other acceleration adapters, I was impressed with the WinSprint 200's crisp display, excellent Windows utilities, and sheer speed in most applications. The board will also ship with a scaled-down version of GT Express (a $395 AutoCAD utility). If your Windows concerns are spreadsheet- and imaging-related, this board deserves your consideration.

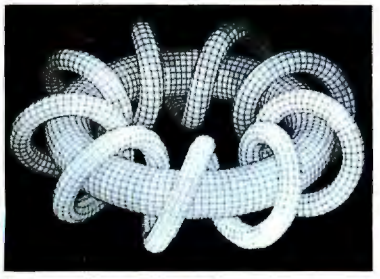
continued

BYTE ACTION SUMMARY

- **WHAT VIDEO-ACCELERATION CARDS DO**
  They transform the tediously slow Windows desktop into a fast, productive environment.
- **LIKES**
  Clean, crisp displays, blinding speed, and (for animators and imaging specialists) TIGA's 16- and 24-bit color renders on standard VGA monitors.
- **DISLIKES**
  Complex installation and non-VBE compliance of some boards.
- **RECOMMENDATIONS**
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Speeding Windows

The basic premise behind Windows acceleration is to free the CPU from most graphics-related processing chores. Video-accelerator or coprocessor chips located on-board an accelerated display adapter off-load these duties from the CPU.

By comparison, standard VGA and Super VGA display cards are merely slower, "nonthinking" conduits for converting CPU-processed digital graphics data into displayable analog color signals. Video-acceleration cards use discrete, fixed-function chips to increase Windows speeds. S3's 86C911, Weitek's W5086, and ATI's proprietary Mach 8 chip, to name just three, can increase performance five- to tenfold.

Fixed-function chips handle graphics chores, such as BitBlts, line/rectangle fills, and font caching, that normally bog down CPU performance. Manufacturer-specific Windows drivers and on-board BIOSes communicate which graphics duties the display-accelerator chip off-loads. It is in these drivers and display BIOSes that manufacturers can gain an edge in speed over competing boards, often while using identical acceleration chips.

Alternatively, coprocessed acceleration cards, such as the TIGA (Texas Instruments Graphics Architecture) TMS34010 and TMS34020, are programmable. Using software-to-hardware communications links at system boot time, a TIGA communications driver is uploaded to the 340x0 processor.

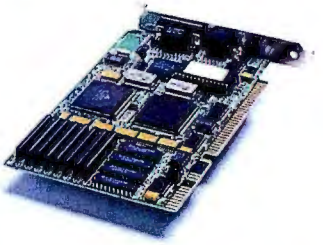
While generally not as fast as fixed-function accelerators, TIGA and other coprocessor boards have a slight advantage over fixed-function chips: You can simply upload any new TIGA software updates from the manufacturer to the coprocessor. With either solution, the benefit to Windows users is speed.

Fixing Functions

ATI's half-length Graphics Ultra card ships with an on-board mouse and an extra bus port in both 0.5- and 1-MB versions. It installed easily after I set the DIP switches. ATI's Mach 8 chip, like S3's 86C911, is a fixed-function accelerator; however, on-board EEPROMs are also custom-programmed for monitor frequency and resolution settings of from 640 by 480 pixels with 256 colors to 1280 by 1024 pixels with 16 colors. The board uses a VBE (VESA BIOS Extension)–compliant TSR driver for DOS applications. (For more on VBE, a standard for integrating the capabilities of graphics adapters, allowing system developers to write universal drivers for all VBE-compliant VGA cards, see Reviewer's Notebook on page 342.)

Windows setup is relatively easy due to the abundant menu choices that confront you during installation. Drivers are placed uncompressed into the Windows subdirectory, and when SETUP executes, it lets you choose the display resolution. ATI's antialiased Crystal Fonts make fonts as small as 6 points easily readable on 14-inch monitors at 1024- by 768-pixel resolution. For objective tests, I used the 1024- by 768-pixel by 8-bit resolution (ATI's "small fonts/large desktop" configuration) without installing the Crystal Fonts. In Windows, the display is markedly sharper and clearer than with most S3-based cards.

The Crystal Fonts are designed for previewing laser output from desktop publishing, and they work beautifully; however, they slow things down dramatically. The time required to perform WordPerfect scroll tests increased from 12.74 seconds to 86.77 seconds when I added Crystal Fonts. However, the document *did* look as good on-screen as on the printed page. The bottom line is, use Crystal Fonts if you like, but only for serious desktop publishing work.



Graphics Ultra

The Graphics Ultra is relatively expensive compared to other S3-based cards.

continued

Why do they call it a dongle?



He wasn't famous. He didn't drive a fancy car, but dressed in his favorite Comdex T-shirt and faded blue jeans, he set out to change the course of the computer software industry. Quite a task for a lonely software developer.

Sitting in front of his computer, drinking pots of coffee and smoking cartons of cigarettes, he'd write pages of code.



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From Paris to Prague, his program was everywhere in Europe. When he got off the plane in Hong Kong he found his program stacked to the ceiling in every computer store. Amazed in disbelief, he bought a hundred cartons of cigarettes and a hundred pounds of Indonesian coffee and flew back to Boston.



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Perhaps it would be less costly if it came without the mouse and bus port, but you may find them useful. Overall, I give the Graphics Ultra high marks for speed, concise documentation, easy installation, and a rock-steady, clear display.

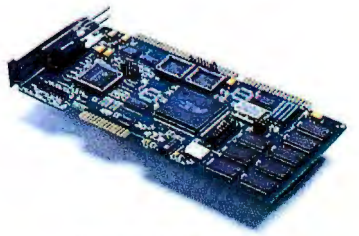


Fahrenheit 1280

Orchid Technology's Fahrenheit 1280 S3-based half-length card comes in 0.5- and 1-MB sizes and supports resolutions of up to 1280 by 1024 pixels with 16 colors. Both models ship with Sierra's "high-color" RAMDAC. Hardware installation is a breeze; you don't need to set any DIP switches. From a no-nonsense installation menu, Windows reconfiguration is similarly painless. In Windows, an Orchid Setup icon sets screen resolutions, colors, and font sizes. In addition, the Fahrenheit 1280 has one of the sharpest displays of the S3-based cards I examined.

The documentation is simply excellent and details driver installation for over a dozen other applications. The package also includes DOS utilities for setting resolutions and refresh rates. According to Orchid, the Fahrenheit 1280 will soon ship with VBE-compliant BIOSes (free of charge to current owners).

Although the tests placed it in the median range for Windows acceleration, I found the Fahrenheit 1280 a good value for its $449 list price because of the extensive DOS applications drivers.



Eclipse II Model 2

The Eclipse II, a 1-MB half-length card from Portocom Technologies, is S3-based and comes in three models. Model 1 comes without a high-color RAMDAC; Model 3 is XGA/high-color compatible. Model 2, my test unit, which ships with Sierra's high-color RAMDAC, installed easily without my resetting the on-board IRQ (interrupt request) jumpers (future boards will have DIP switches). The Eclipse II

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Circle 22 on Inquiry Card (RESELLERS: 23).

Local Bus Video

Today, 386 and 486 CPUs running at 16- to 50-MHz speeds process information on 32-bit data paths. However, when these processors are coupled with an ISA bus, bottlenecks occur. Graphics data must slow down to ISA's 8- to 10-MHz speeds and travel through ISA's 8- or 16-bit data paths. It's like what happens when traffic on a 55-mph, 32-lane expressway funnels down to 16 or 8 lanes at 30 to 10 mph.

LBV (Local Bus Video) circumvents this traffic jam by managing display data on 32-bit data paths at speeds identical to those of the host CPU (see figure A). LBV provides you with dramatic speed increases for 8-, 16-, and 24-bit color with higher display resolutions. (A single, uncompressed 1024- by 768-pixel by 24-bit screen can contain as much as 3.2 MB of image pixel data.)

Unfortunately, however, there isn't one standard LBV architecture. Considerable confusion has surfaced around the merits and drawbacks of different versions emerging from various vendors, manufacturers, and standards committees.

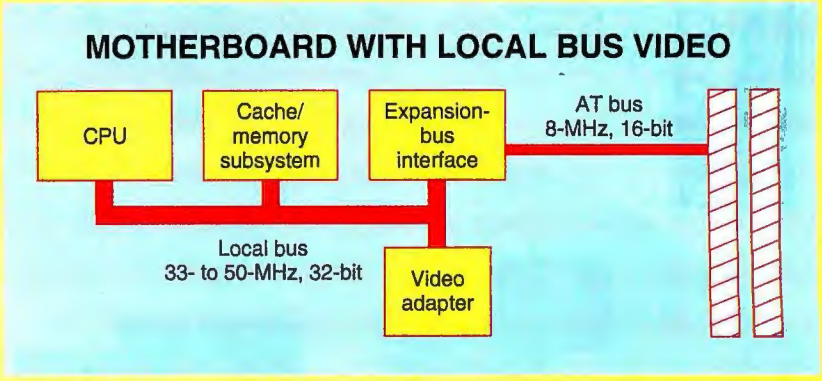


Figure A: *The CPU, memory/cache subsystem, and expansion bus interface make up the heart of the motherboard. They are connected by a high-speed synchronous local bus that runs at the speed of the CPU. With this architecture, PC makers are realizing speeds that are four to 16 times faster than those of motherboards built around asynchronous buses, such as ISA, EISA, or Micro Channel.*

Taking the Local Bus

Perhaps the simplest route to LBV is to integrate Super VGA chip sets directly on the motherboard as 32-bit ASICs (application-specific ICs) with direct 32-bit CPU data-path connections. Some manufacturers think that etching Super VGA discrete logic directly on the CPU is the way to go.

Emerging and rapid advances in display resolutions and specifications may make both the ASIC and discrete-logic solutions undesirable. Of the accelerator manufacturers I spoke with, most think that LBV should—and probably will—be implemented using 32-bit EISA- and Micro Channel–based bus architectures operating at direct CPU MHz rates.

In addition, VESA (Video Electronics Standards Association) has established LBV committees. At June's 1992 PC Expo, VESA plans to examine emerging and current implementations of LBV connector, signal, and data-path structures; meanwhile, manufacturers haven't been waiting for VESA to standardize LBV. Many of them currently produce brand-specific LBV products, and most are hopeful that their LBV implementations will get VESA's nod of approval.

CSS Laboratories' LBV-style motherboards start with EISA's 32-bit bus architecture as a foundation for increasing display I/O. CSS's Preferred 433GE, a 486/33 motherboard, uses proprietary EISA local-bus graphics slots with 33-MHz direct CPU connections instead of ISA's 8- to 10-MHz bus connections. CSS's MaxGraphics/32 accelerator card sits directly in its 32-bit bus and, like the MaxGraphics/16 reviewed here, implements S3's accelerator chip. CSS-supplied 433GE data sheets showed display-speed performance improvements of over eightfold when benchmarked against Tseng Laboratories' ET3000 ISA-based display adapter.

Other manufacturers, such as Portocom, are developing LBV cards based on OPTi's OPTi496 standard. Portocom's Eclipse II LB adapter also uses S3's chip in 32-bit, direct-CPU-connect data paths. It should be shipping by the time you read this.

Jake Richter, a VESA director and president of Panacea, recently described Chips & Technologies' 32-bit LBV-style platform—which debuted at recent European computer conventions—as "impressive and blazingly fast," but it is yet another standard. Likewise, Orchid Technology's Superboard, a 50-MHz 486 motherboard, has 32-bit, direct-CPU-connect slots. For LBV acceleration, you must plug in one of Orchid's D Series display adapters, which also function like the Fahrenheit 1280 16-bit ISA bus adapter reviewed here but are customized specifically for LBV performance using its 486/50 Superboard.

Other players entering the LBV arena include S3, Micronics, Trident, Tseng, Headland, Appian, Western Digital, Dell, and Intel, to name just a few. Add emerging graphics and associated technologies to this LBV "stew pot," such as the MPC motion video specification or Intel's DVI, as well as JPEG/MPEG (Joint Photographic Experts Group/Moving Pictures Experts Group) compression standards, and you can envision rough waters ahead for LBV sales. These days, there is an awful lot of consumer confusion over the swelling number of unsupported LBV configurations.

Whichever way LBV turns, given the number of manufacturers entering the LBV field, you can expect fierce competition, which will ultimately lower prices.

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Selective Alerting lets you assign up to five levels of ring tone priority (through your PC audio system) to alert you to the most important calls.

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WindowPhone automatically logs incoming and outgoing calls with the caller's name, number, the date, time and call duration.

WindowPhone.™ The Personal Call Manager with Caller ID Teleconnections

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If you've been out, WindowPhone maintains your call counter and automatic call log — even if your PC is off. Use the unanswered call window to return calls or store numbers in the phone books. There's even a handy call reminder feature.

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Your 20 most-used numbers can be entered in the Speed-Dial window.

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WindowPhone Advantages Without Caller ID

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WindowPhone is easy to learn and takes just a few minutes to install and use. Help screens are extensive, with icon options designed for the Windows environment. The WindowPhone board and software, operator's manual and registration card are included.

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WindowPhone includes: application and set-up software, one half-size Industry Standard Architecture (ISA) 8-bit WindowPhone PC card; one 120 VAC 60 Hz to 6 VDC wall-mountable power converter; one 6-foot RJ-11 modular telephone cord; User Guide; Quick Reference Guide; Warranty Registration Card; and License Agreement. IBM PC compatible. You must have a single party telephone connection to a direct outside line, Windows 3.0 running on an 80286, 80386 or 80486 processor. Two megabytes of RAM recommended, 3.5" or 5.25" high density disk drive and standard hard drive required. WindowPhone is a trademark of AG Communication Systems Corporation. All other trademarks referenced are the proprietary service marks, trademarks or registered trademarks of their respective manufacturers.

Circle 67 on Inquiry Card.

COMPARING WINDOWS ACCELERATOR CARDS

A variety of memory configurations, display resolutions, and available colors mix with various TIGA and fixed-function full- and half-length graphics accelerator cards. (N/A = not applicable.)

	Hercules Graphics Station Gold 16	Hercules Graphics Station Gold 24	Artist Graphics WinSprint 200	ATI Graphics Ultra	Orchid Fahrenheit 1280
Type	TIGA (TMS34010)	TIGA (TMS34010)	TIGA (TMS34020)	Mach-8 (fixed function)	S3 (fixed function)
Size	Full-length	Full-length	Full-length	Half-length	Half-length
Memory/price	1 MB/$495 2 MB/$695	1 MB/$595 2 MB/$795	1 MB/$995	0.5 MB/$699 1 MB/$899	0.5 MB/$399 1 MB/$449
VBE compliance	N/A[1]	N/A[1]	N/A[1]	TSR	BIOS (coming soon)
Number of colors/highest resolution	32,768 colors[2] 256 colors/ 1024 x 768	16.7 million colors[2] 256 colors/ 1024 x 768	16 colors/ 2048 x 768 or 1024 x 768 256 colors/ 1024 x 768	16 colors/ 1280 x 1024 256 colors/ 1024 x 768 640 x 480	16 colors/ 1280 x 1024 256 colors/ 1024 x 768
Comes with	ImagePrep software; Autodesk product drivers	ImagePrep software; Autodesk product drivers	Windows utilities; AutoCAD GT Express	Mouse/bus port; DOS drivers; CAD drivers	Sierra's RAMDAC; DOS drivers; CAD drivers

[1]Uses VGA pass-through. [2]16- and 24-bit at 512- by 480- pixel resolution.

supports resolutions of up to 1280 by 960 pixels by 4 bits (16 colors).

Windows reconfiguration is also simple with the Eclipse II; the forthright install/utility menu also contains Lotus 1-2-3, Microsoft Word, WordPerfect, and seven CAD drivers. This allows direct reconfiguration and driver installation for these additional applications from one convenient main menu. Portocom's Windows SETUP utility is clever. It whisks you directly into Windows SETUP to select screen resolutions and then takes you back to Portocom's menu. From there, you simply exit into Windows.

The Eclipse II display is a little fuzzy and posted medium to high results for speed. The card is not VBE-compliant, but Portocom plans to ship a VBE TSR driver shortly. However, both hardware and software installations went very smoothly. The documentation, although not slickly produced, is technically excellent. At a $325 list price, the Eclipse II gets a big thumbs-up for best price-to-performance ratio.



MaxGraphics/16

CSS Laboratories' MaxGraphics/16 1-MB half-length card ships with Sierra's high-color RAMDAC. It supports resolutions of up to 1280 by 1024 pixels and 16 colors. Besides Windows, several CAD and word processing drivers come with it.

The card installs easily even though there are numerous on-board jumpers for IRQ, BIOS, and bus settings. I referred to the manual (sparse and somewhat bland, but technically accurate) to determine how to position the jumpers when I changed refresh rates and monitors. Reconfiguration uses the Windows SETUP routine for resolution selection and driver installation.

It appears, at least from the drivers' floppy disk, that CSS has used plain-vanilla S3 accelerator drivers. The MaxGraphics/16 is not VBE-compliant, and CSS says that it has no plans to become VBE-compliant until S3 releases its VBE-compliant version (1.7) of the 86C911 chip. (See Reviewer's Notebook on page 342 for more on S3/VBE compliancy.)

Inside Windows, the MaxGraphics/16's screen resolution is sharp and solid. Although the card tested in the medium-to-fast range on the acceleration benchmarks, given its $395 price, you would expect more features, such as menu customization and lots of additional drivers (as you find with Portocom's adapters). I give the MaxGraphics/16 a yawn at this price; however, if you can find it for less—much less—it might prove to be a fair buy.



GraphicsEngine

The GraphicsEngine half-length card from Actix Systems ships with either 1 MB (for $349) or 0.5 MB (for $299) of VRAM along with Sierra's high-color RAMDAC. The 1-MB card is the one I tested; it supports resolutions of up to 1280 by 960 pixels with 16 colors. Besides the Windows 3.x drivers, GraphicsEngine comes with 15 applications and CAD drivers and proved to be one of the speedier S3-based adapters.

Installation is simple. None of the rear-mounted DIP switches needs to be reset. There are on-board interrupt jumpers to set for conflicts, and the well-written, professional manual explains everything clearly. The Windows 3.0 or 3.1 reconfiguration is also simple and is accomplished from an elegant installation menu.

The Windows display is crisp, sharp, and undistorted at all resolutions. Inside applications, you can measurably feel the speed differences, especially in WordPerfect. GraphicsEngine also gave PhotoStyler a "turbo" feel. Although it's not VBE-

Portocom Eclipse II Model 2	CSS Laboratories MaxGraphics/16	Actix GraphicsEngine	STB Wind/X Ultra	Diamond Stealth VRAM
S3 (fixed function)	S3 (fixed function)	S3 (fixed function)	S3 (fixed function)	S3 (fixed function)
Half-length	Half-length	Half-length	Half-length	Half-length
1 MB/$325	1 MB/$395	0.5 MB/$299 1 MB/$349	0.5 MB with mouse/$359 1 MB with mouse/$439 0.5 MB, no mouse/$299 1 MB, no mouse/$379	1 MB/$445
No (TSR coming)	No (waiting for S3)	No (TSR coming)	BIOS	BIOS
16 colors/ 1280 x 960 256 colors/ 1024 x 768	16 colors/ 1280 x 1024 256 colors/ 1024 x 768	16 colors/ 1280 x 960 256 colors/ 1024 x 768	16 colors/ 1280 x 1024 256 colors/ 1024 x 768	16 colors/ 1280 x 1024 256 colors/ 1024 x 768
Sierra's RAMDAC; CAD and word-processing drivers	Sierra's RAMDAC; several CAD and word processing drivers	Sierra's RAMDAC; 15 applications drivers; Windows 3.x drivers	With or without Sierra's RAMDAC ($40); numerous applications drivers and refresh utilities	Sierra's RAMDAC; TurboWindows 3.x drivers; WinRix paint program; Panacea's AutoCAD ADI drivers; 6 other CAD, word processing, and spreadsheet drivers

compliant (Actix plans to release a TSR), I rate this elegant board as a good value, especially at this price and speed.



Wind/X Ultra

STB Systems' Wind/X Ultra half-length card comes in a wide variety of choices: 0.5 or 1 MB with a Logitech BusMan Mouse ($359 and $439, respectively), and either size without a mouse ($299 and $379, respectively). You can get any model with or without Sierra's high-color RAMDAC (models without the RAMDAC cost $40 less). The Wind/X Ultra supports display resolutions as high as 1280 by 1024 pixels with 16 colors. Numerous applications drivers and refresh utilities come with the card.

I installed the 1-MB with-a-mouse adapter effortlessly, although there's a myriad of IRQ, BIOS, bus, mouse, and display-memory jumpers you can set. (The mouse worked right off the bat using default jumper settings.) STB's thin but competent documentation is technically very good.

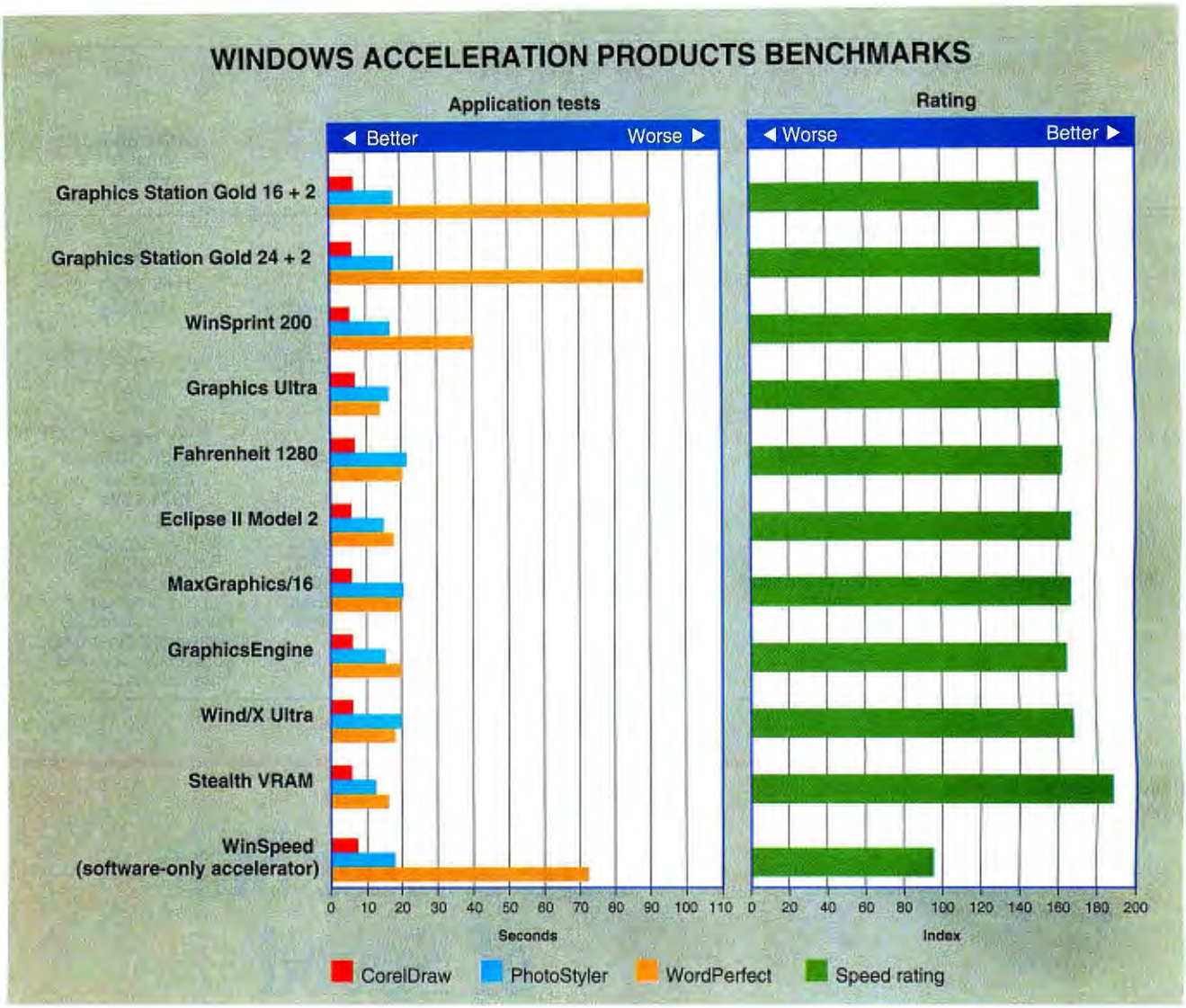
Windows reconfiguration was equally easy, although not very elegant. In the WINDOWS\SYSTEM subdirectory, you

The Softer Side of Speed

Just because you don't have an extra $300 to $1000 to purchase a new video-acceleration card, you don't have to view your trusty old nonaccelerated VGA or Super VGA card with disdain. There's a software alternative available for most cards. Panacea's WinSpeed for Windows 3.0 and 3.1 is a $79 acceleration driver that installs easily from a 5¼- or 3½-inch floppy disk and can boost performance in some applications by as much as five times. WinSpeed supports 256-KB-, 0.5-MB-, and 1-MB-equipped VGA and Super VGA boards with chip sets from manufacturers such as ATI, Paradise, Trident, Tseng Laboratories, Video Seven, and Zymos, at resolutions of from 640 by 480 pixels to 1024 by 768 pixels in 256 colors.

In the objective tests performed, WinSpeed couldn't compete with the speeds that the hardware accelerators demonstrated, but it did provide noticeable speed improvements (from 10 percent to 30 percent) over the Super VGA adapter alone. For a simple software-only add-on solution, I was surprised to discover that WinSpeed shaved almost 35 seconds off the WordPerfect multifont document-scrolling tests.

If your display card isn't among those listed above, Panacea can tell you whether or not WinSpeed supports it. Many VGA and Super VGA cards are capable of emulating other chip sets. At $79, you won't find a better, quicker, easier, or less expensive route to increasing Windows speed and application productivity.

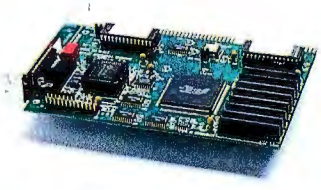


The benchmark tests consisted of running both graphics- and text-oriented Windows applications. In CorelDraw, I opened Pantone's color-process chart and then timed redisplays while opening the color-preview box. In WordPerfect for Windows 5.1, I performed scrolls through a 47.5-KB, 22-page, multifont document (MACRO.DOC). In Aldus PhotoStyler, I timed a 9.5-MB 2048-pixel by 1536-line, 120-dpi, 24-bit Targa file for image regeneration after screen scrolls. I rated BitBlt and memory-to-screen writes using a freeware utility, Windows Speed 1.0, which averages these functions in a Windows video-performance-index rating. (You can find the utility on BIX in the IBM.WINDOWS listings.) I performed each test three times and averaged the results. I checked the tests against controls run on a standard unaccelerated Super VGA adapter, a Diamond SpeedStar with 1 MB of VRAM, with a Tseng Laboratories ET3000 chip set at 1024- by 768-pixel by 8-bit resolution.

The test system configuration consisted of a Zeos 486/25 EISA with 8 MB of extended memory and two 344-MB SCSI hard drives. For resolutions of from 640 by 480 pixels to 1024 by 768 pixels in both interlaced and noninterlaced modes, I used two multiscan monitors: a 14-inch Relisys RE-5155 and a 14-inch Optiquest 3000 for gauging the display clarity of each card (the Optiquest employs a Sony Trinitron CRT with a 0.24-mm dot-pitch ratio). For resolution tests above 1024 by 768 pixels, I used a 20-inch Nanao FlexScan 9500 monitor. The pointing device was a Wacom cordless puck and digitizer tablet.

Figure 1: *In every test, Diamond Computer Systems' Stealth VRAM was the fastest of the S3- and TIGA-based adapters that BYTE tested.*

decompress font and system files from drive A and then invoke SETUP to choose resolutions. The Windows display is clear and crisp; however, the objective benchmarks unveiled speeds slower than I had expected. After speaking with technical support and a programmer, STB Systems said that additional drivers providing a 10 percent to 30 percent speed increase would be shipping shortly. If the new drivers truly do increase the speeds, I would seriously consider the Wind/X Ultra, especially at these prices with a Logitech mouse.



Stealth VRAM

Except in minor areas, Diamond Computer Systems' Stealth VRAM is absolutely stunning and blindingly fast. The $445, 1-MB half-length adapter ships with Sierra's high-color RAMDAC, supporting resolutions of up to 1280 by 1024 pixels with 16 colors. The Stealth VRAM ships with TurboWindows 3.x drivers, a WinRix true-color paint program (for 640- by 480-pixel, 32,768-color mode), and Panacea's AutoCAD ADI (Autodesk Device Interface) drivers (see the text box "The Softer Side of Speed" on page 181). Six additional drivers for CAD, word processing, and spreadsheet applications come standard with the product.

The board installs fairly easily without the repositioning of on-board jumpers, but I did have trouble setting rear-panel DIP

The Pros Rate CA-SuperCalc Higher Than Lotus 1-2-3 And Microsoft Excel.

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VARBUSINESS Spreadsheet Report Card

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Ease of programming	6.48	5.86	6.26
Ability to manipulate data	7.31	6.71	7.00
Sorting capabilities	7.50	6.64	6.68
Provision for software security	6.96	5.25	5.10
Report writing capabilities	6.78	5.33	6.17
Ease of use of interface	7.45	6.19	6.77
Software integration capabilities	7.30	6.23	6.78
Ease of data retrieval	7.50	6.78	7.00
Satisfaction with product profitability	6.81	5.75	6.42
Overall quality of product	7.70	7.18	7.53
Provision for customer support	7.52	5.79	6.22
Charges for training time	6.43	5.60	5.71
Provision for technical support	7.34	5.55	5.95
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OVERALL AVERAGE	**7.09**	**6.05**	**6.44**

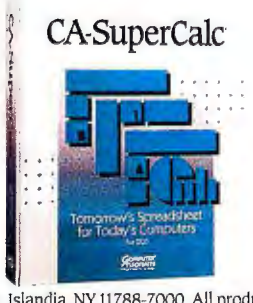
Recently, *VARBUSINESS* conducted a survey of some people who know more about spreadsheets than anyone.

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Circle 21 on Inquiry Card.

switches correctly. The manual is slick, professional documentation with superb artwork. However, the DIP-switch section is a bit confusing; it took a few rereadings before I set the switches properly.

Windows installation is equally slick; after decompressing the driver files into a VRAM subdirectory, a mouse-driven menu system steps you through driver installation. Windows SETUP simply provides a way to select resolution.

In Windows, the display is crystal sharp, and applications simply blitz. In every objective Windows test, the Stealth proved the fastest of the S3- and TIGA-based adapters I looked at. And this card also hustles in the DOS environment, making short work of long directory listings.

Shortly before press time, I spoke with the folks at Diamond about non-VBE-compliancy problems. Diamond's new VBE-compliant BIOSes arrived the next day, and I installed them easily. As promised, all my VBE tests and VBE applications software ran perfectly. Diamond is supplying the VBE-compliant BIOS to all Stealth VRAM owners free of charge.

Although the $445 list price is a bit steeper than that of most of the other S3-based cards, and leaving aside minor setup difficulties, the warp-drive speeds this accelerator demonstrates secure Diamond's Stealth VRAM card a rock-solid five-star rating and my overall recommendation for today's best buy in acceleration cards.

Future PC Feel

As most of these adapters demonstrate, accelerating the Windows environment improves overall applications performance and increases productivity. And most of these cards come with drivers for a multitude of other applications as well.

At present, adding a display-acceleration card with a driver specific to your application needs is one of the best paths to take to improve the speed of your Windows-based applications. With such a card, you can get a feel for what it will be like to work on tomorrow's 50-MHz, 100-MHz, or higher-performance PCs—today. ■

Greg Loveria is a computer graphics and desktop publishing consultant, animator, and writer in Binghamton, New York. He can be reached on BIX as "loveria."

COMPANY INFORMATION

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fax: (408) 986-1646
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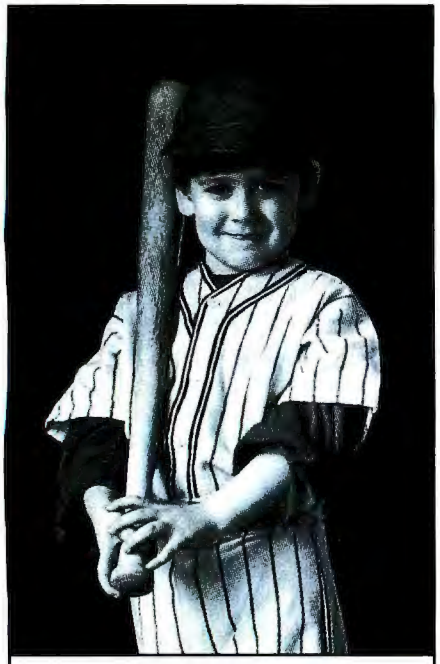
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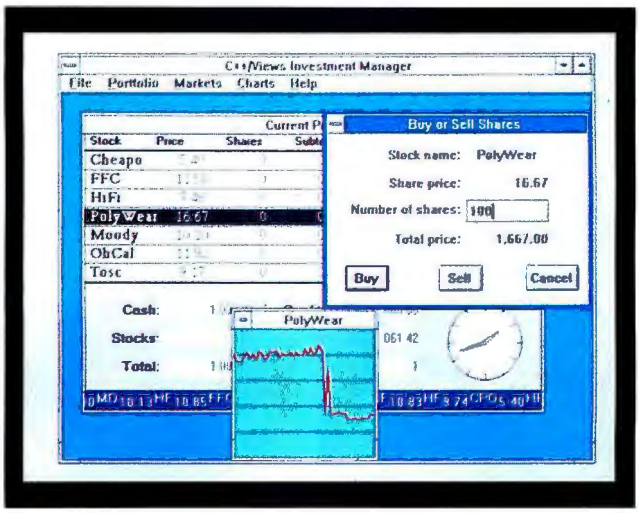
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A FEW OF OUR FAVORITE THINGS

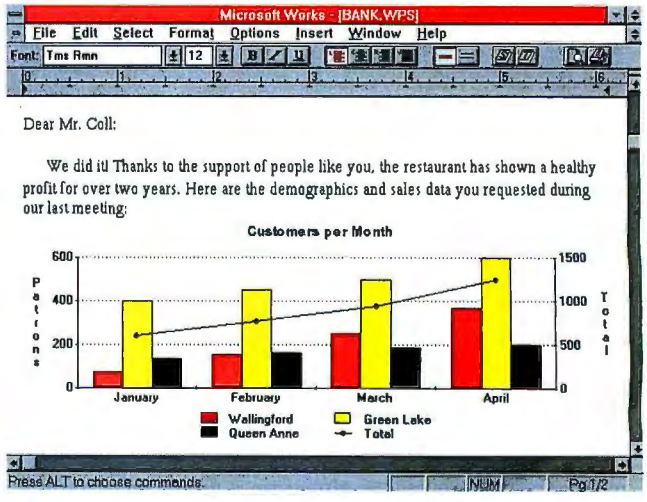
We like to think of the BYTE staff as representative of the community of personal computer users. We have people who use PCs, people who use Macs, and people who use Unix machines. We have people who have moved to Windows. Some of them do most of their work in Windows now, some pop back and forth between Windows and DOS, some use Windows so they can run a favorite application, and some use it mostly as a task switcher.

One thing that's made the move to Windows appealing is the collection of software that runs under Microsoft's graphical environment. Look at all the great applications that either have been developed specifically for Windows or have been transported from the Mac. Word processors, desktop publishing programs, programming tools, spreadsheets, databases, draw and paint programs—they've all come to Windows.

We've adopted a lot of those programs here at BYTE. The products covered in this collection of "favorite things" are the tools we find ourselves using regularly and the tools we pick up to accomplish certain tasks. They're the tools that help us work.

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When I first came to BYTE, I got puzzled looks from other editors because I used the DOS version of Microsoft Works as my editing environment. I was drawn to it for its simple, yet surprisingly capable, word processor. The other integrated applications in the Works bundle—spreadsheet, database, communications—meant I didn't need to load down my hard disk with full-size programs, most features of which I'd never use.

I leapt at Works for Windows immediately on its release. The WYSIWYG word processor uses most of the original Works key sequences, while taking on a Word for Windows–style toolbar. Under Windows 3.1, TrueType fonts make the on-screen representation of the document even more accurate.

The other elements of Works for Windows shouldn't be overlooked. Most notable is the spreadsheet, which also benefits from the Windows environment's sleek interface and scalable fonts. My one gripe is that the graphs are still boring and flat.

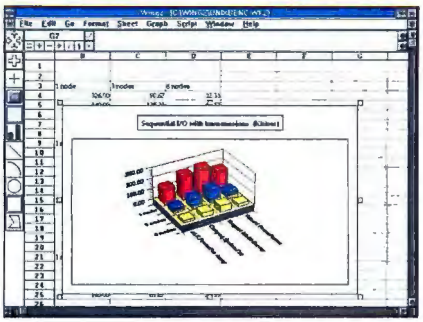
Works for Windows supports OLE (Object Linking and Embedding) and even provides a special application that's accessible through an OLE link: Microsoft Draw. This is a simple polygon-drawing program, but the drawings are very easy to paste into a document and modify later.

Having everything under one roof means all the modules share a single pull-down menu bar and you can open multiple documents of various types simultaneously—all as child windows of a master application window. Works for Windows is small, fast, and complete. It has freed me from the need to devote space on my Toshiba T2000SX notebook to large, overpowered, dedicated applications.

—Tom Yager

WINGZ FOR WINDOWS

$499
Informix Software, Inc.
4100 Bohannon Dr.
Menlo Park, CA 94025
(800) 331-1763
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Designed originally for the Macintosh world, Wingz is a perfect fit for Windows; this spreadsheet was born to be graphical. All the inherent benefits of a Windows spreadsheet—effortless graphing and charting, desktop publishing–like presentation features, dynamic links to other Windows applications—are naturals for Wingz.

I often use Wingz to create large tables of product features. Each column contains information on a single product. To verify the data before it gets published in BYTE, I fax each segment of the table to the appropriate vendor. With Wingz, I simply highlight each column in turn, specify it as a report range, and print it. By setting the first row as a title, I can have each report automatically include the row headings. I can verify the printout with a quick WYSIWYG preview; and if it doesn't quite fit on a single page, I can scale down the printout or the sheet itself.

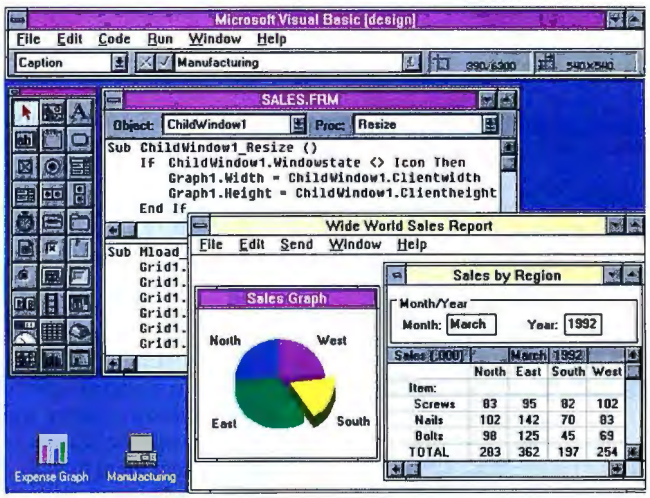
There are a few idiosyncrasies I wish Informix would fix. When you create a horizontal bar chart, the entries are listed from bottom to top, the reverse of how they are listed on the worksheet. And although you can highlight noncontiguous data, you can't create graphs that way.

All the stuff this program can do sounds old-hat now, but Wingz was doing it back when it was cool stuff. Maybe that's why Wingz hasn't seen a major upgrade in a while: It was so far ahead, the other guys are still catching up.

—Stanford Diehl

VISUAL BASIC

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VB (Visual Basic) is to Windows what GWBASIC was to older versions of DOS: the quickest, easiest way to develop simple applications. VB has introduced countless nonprogrammers to the power of custom applications, and it offers experienced developers a fast track to finished Windows programs.

VB looks like a graphical programming system. It isn't; it still depends on procedural (although event-driven) code. The innovation is in the way VB ties that code, broken into manageable modules, to interface objects.

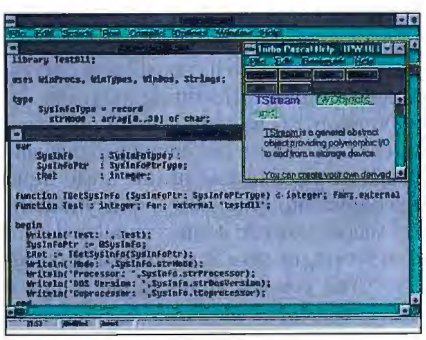
The language is a mix of the extended BASIC dialect and new directives to handle graphical interfaces and event-driven programming. Well-written BASIC programs are still the easiest to read and understand. And BASIC's similarity to English makes it the easiest "serious" programming language to learn.

It's my hope that VB will spark a trend in programming. Good software need not be difficult to write. Faster computers, more disk space, and more memory make it reasonable to expect development tools to handle more of the burden. VB comes as close as any product to being the perfect development environment.

—Tom Yager

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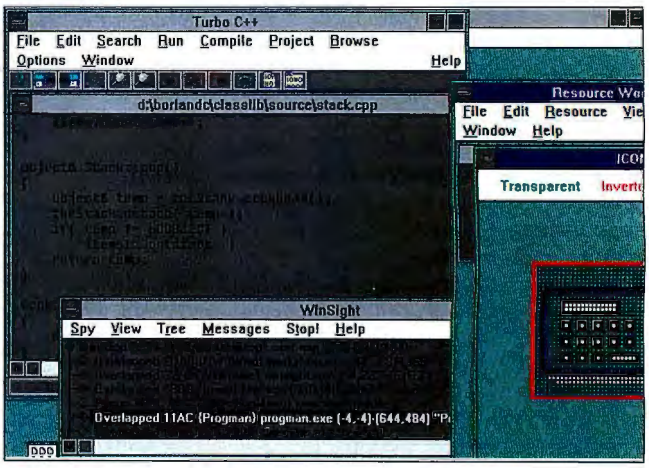
Borland's Turbo Pascal for Windows (TPW) remains one of the best examples of a compiler for which Windows is both host and target. Turbo Pascal's twin hallmarks—convenience and elegant OOP (object-oriented programming) support—carry forward beautifully to the Windows environment. TPW's multiple-document interface, thorough on-line help, and integrated toolset make it a joy to use. Thanks to the handy WinCRT unit, you can run your console-oriented Turbo Pascal programs under Windows right away. When you venture into real Windows programming, you'll appreciate TPW's full encapsulation of the Windows API. I particularly like the DLL support. All Windows language products can call DLLs, but few can create them as easily as TPW can.

Of course, there's also the OOP approach to Windows programming. The OWL (ObjectWindows library) now popular with Borland C++ programmers made its debut in TPW. The OWL abstractions handle dialog boxes and controls and wrap frameworks around them, so you can, for example, easily create your own multiple-document-interface programs. TPW does credit to both Pascal and Windows.

—Jon Udell

continued

BORLAND C++



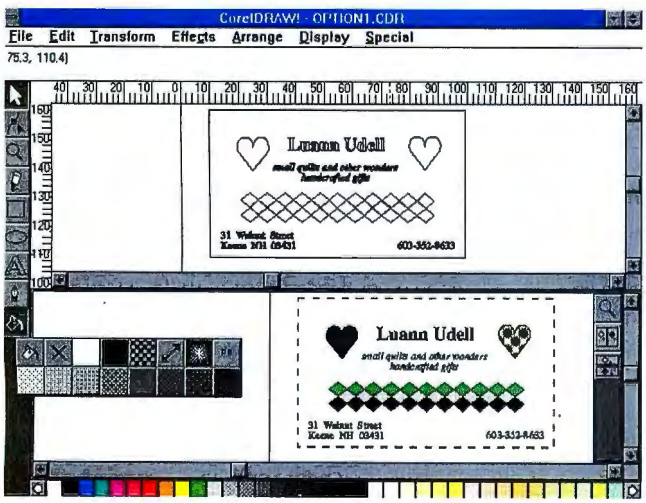
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In a single package, Borland C++ 3.0 includes everything a Windows developer needs. It's a collection of tools aimed at the serious Windows developer. It has a command-line compiler, an integrated development environment for DOS, a limited Windows-hosted IDE (integrated development enivronment), a sophisticated debugger, and other programs and utilities. Borland C++ is the most versatile choice if you develop for both DOS and Windows. Besides a full suite of DOS tools, it has an application framework library (Turbo Vision) for text-mode windowing DOS applications.

Wars will rage over whether Borland C++ or Microsoft C++ generates the tightest code, whose environment is superior, and whose class library is built on the best architecture. This is not the forum for such a debate; each package has its strengths. But Borland C++ is a fast compiler that generates well-optimized, bug-free code, and it's the environment I prefer.

From inside TCW (Turbo C++ for Windows), the Windows-hosted IDE that comes bundled with Borland C++, you can edit, compile, test, and browse your object hierarchy. Unfortunately, to get full optimization or the full-blown debugger, you need to revert to non-Windows-hosted tools.

—Steve Apiki



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When I need to redesign my wife's business card or illustrate some technical concept for a BYTE article, I usually reach for CorelDraw. As feature-rich as any product in its class, it still manages to keep simple tasks simple. The tool palette, which seems sparse at first glance, both shows and hides the right amount of information. The bread-and-butter chores—drawing, aligning, and filling objects, and manipulating text—flow straightforwardly from the palette and work the way I expect them to.

But you can get as fancy as you want to. In one case, I needed to illustrate the grid-fitting that ATM (Adobe Type Manager) and TrueType perform. No sweat—I drew a grid, picked one of the outline fonts included with the package, converted it to its constituent curves, and then did the grid-fitting manually.

Version 2.0 brought several nifty features. You can use an "envelope" that surrounds a piece of text or line art to mold the object into symmetrical or asymmetrical shapes, extrude it into a simulated third dimension, or give it simulated perspective. And you can augment the standard set of bit-mapped and PostScript vector-fill patterns with your own vector-fill patterns made from arbitrary chunks of CorelDraw line art. CorelDraw's import/export filters are another strong point. I've even used the program to transfer art between two Macintosh formats.

—Jon Udell

HOLLYWOOD

$499
Claris Corp.
5201 Patrick Henry Dr.
Santa Clara, CA 95052
(408) 727-8227
Circle 1091 on Inquiry Card.

Time is almost always of the essence when I need to pull together a presentation. Hollywood lets me do a workmanlike job against the clock. Hollywood's outliner lets me quickly type out my ideas and juggle the order of my slides for the best flow. I can easily choose slide formats, and with the Color Schemes module, I soon have agreeable background, text, and bullet colors. I haven't time to be creative mixing and matching colors and fills, so I welcome the clean, if bland, appearance of the color templates. The overall look communicates a basic level of professionalism.

My problem with Hollywood stems from its complexity. I don't need to do presentations regularly; I'll typically go weeks between using the program. But when I do need Hollywood, I need it up and running quickly. I find myself walking through a few dark alleys as I try to remember where commands await.

Hollywood's range of features comes at the price of a bumpy relearning curve. But, except when my blood pressure rises against a particularly tight deadline, the benefits of Hollywood compensate for this cost.

—Alan Joch

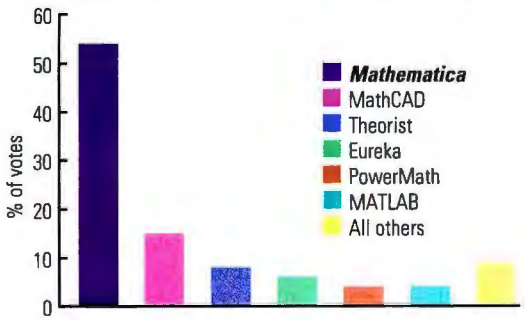
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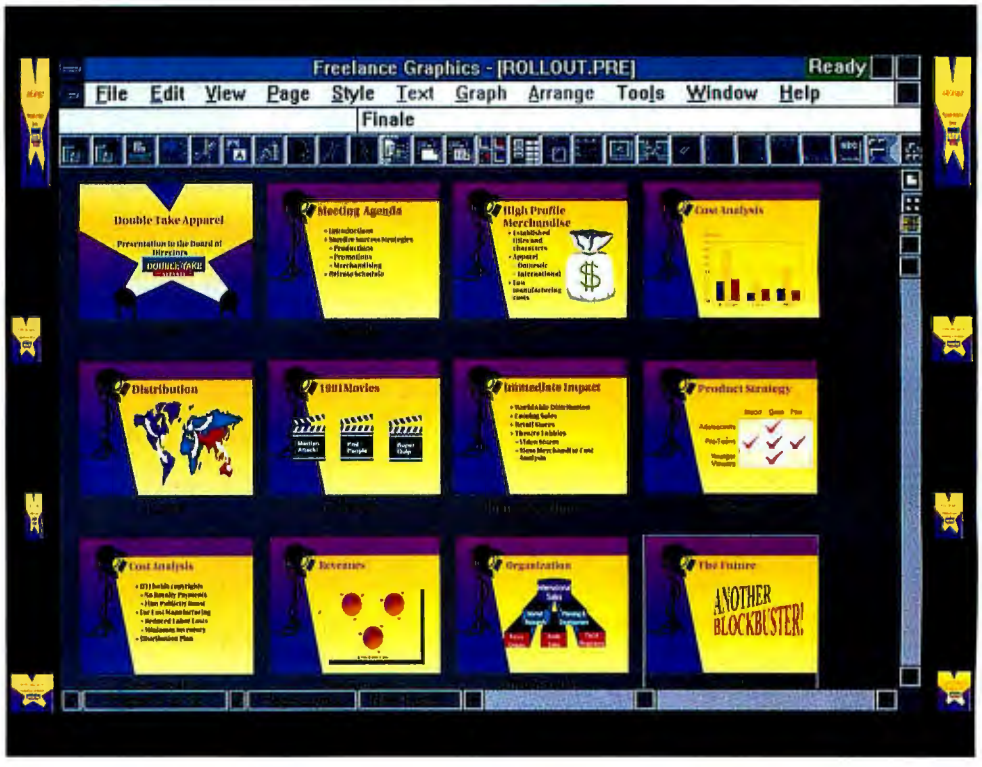
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Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(800) 343-5414
Circle 1089 on Inquiry Card.



Most people do not need to use a presentation software package every day. I give, at most, five formal presentations during the year. So once I've decided what I want to say, I want a software package that lets me produce good-looking charts and graphs as painlessly as possible. Enter Lotus's Freelance Graphics for Windows.

Freelance Graphics is easy to use. Its SmartMaster templates simplify making stylistic, coherent presentations. It's essentially a fill-in-the-blanks procedure. When you choose a format for your slides, Freelance Graphics prompts you to "type title here." You just click on the area and start typing. Click on the "insert symbol," and up pops a symbol library of clip art. Freelance's outliner looks like the ubiquitous yellow legal pad.

Freelance doesn't have the sophisticated technical charts most researchers and scientists rely on. But that lack is a small price to pay for not having to climb a high learning curve. With Lotus's program, you can produce a professional-quality slide show in less than an hour. In that regard, Freelance has few peers.

—Rich Friedman

WINFAX PRO

$119
Delrina
Technology, Inc.
6830 Via Del Oro,
Suite 240
San Jose, CA
95119
(408) 363-2345
fax: (408) 363-2340
Circle 1090 on Inquiry Card.



Computers and faxes should be made for each other, but the courtship has been a rocky one. Getting fax modems to work has too often been a head-banging exercise because of the non-graphics-oriented world of DOS and incompatible standards.

Enter Windows, along with the new generation of high-quality Class 2 computer modems that conform to an industry standard. The key to negotiating the marriage of these two is a matchmaker, and that's where WinFax Pro comes in. With this package you can fax documents directly from any Windows application just by printing; the text is sent out through the modem instead of going to your printer. The receiving end gets a high-quality fax document.

WinFax Pro is an almost indispensable time- and work-saver. I can broadcast a fax to any number of people, and I can customize cover sheets and logos with a few mouse-clicks. Because it also receives faxes, WinFax Pro eliminates the pesky roll of annoying curly fax paper on my office floor each morning. At least on my end, it's a giant step toward the paperless office.

—Stan Miastkowski

DYNACOMM 3.0

$295
Future Soft Engineering
1001 South Dairy Ashford, Suite 101
Houston, TX 77077
(713) 496-9400
Circle 1088 on Inquiry Card.

DynaComm 3.0 blends text- and graphics-based computing with an elegant interface. It adds Windows elements as appropriate, but otherwise, you work with your conferencing system or BBS on its own terms.

DynaComm has more features than I can enumerate here, including INT 14 support for dealing with network communications servers, a reasonable list of transfer protocols, a built-in viewer for looking at images in the GIF format, and a robust scripting language. DynaComm presents it all under a multiple-document interface design that makes it easy to organize communications windows, scripting windows, and collections of buttons.

—Steve Apiki



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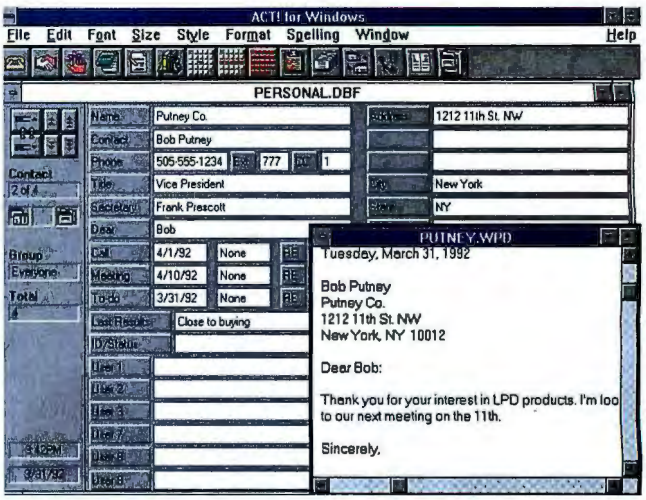
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ACT FOR WINDOWS 1.0

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Contact Software International
1840 Hutton Dr., Suite 200
Carrollton, TX 75006
(214) 919-9500
fax: (214) 919-9750
international: 44 (0) 753 833317
Circle 1093 on Inquiry Card.



Think of Act for Windows as a customizable contacts database surrounded by a set of modules for handling different functions: a WYSIWYG calendar for appointments and to-do items; a word processor with Houghton Mifflin's spelling checker; letter and memo templates; activity reports; a macro builder; and a telephone list and dialer. In short, Act for Windows is a complete environment for people who spend much of their time contacting, meeting, and following up with other people.

Besides the graphical interface, Act for Windows offers many improvements over its DOS counterpart. The contacts database has 71 customizable fields and adds phone number, time, date, currency, and integer field types. You can schedule recurring events, prioritize events, and reschedule an event by clicking and dragging it across the daily, weekly, or monthly calendar. Unlike the DOS version, Act for Windows does not print index cards or mailing labels, run on a network, support fax modems, or record business expenses.

I can take contact information and word processing files compiled with Act and export them as dBase and RTF files, respectively. Act doesn't support OLE but does support DDE, with predefined links to Objectvision, Word, Ami Pro, and WordPerfect for Windows. On-line help and an intuitive user interface make mastering Act for Windows quick and painless. I recommend it if you need to keep in contact with dozens, or even hundreds, of people.

—Rob Mitchell

LANTASTIC

$299
Artisoft
691 East River Rd.
Tucson, AZ 85704
(602) 293-4000
fax: (602) 293-8065
Circle 1094 on Inquiry Card.



Novell NetWare's high pricing gives many a small business pause. For those without deep pockets and a full-time system administrator, Artisoft's peer-to-peer LANtastic is a good solution.

Administering a network isn't simple, but Artisoft's LANtastic for Windows makes the chore simple and elegant. This add-on utility makes full use of Windows' abilities: pull-down menus, icons, graphics, and multitasking. And you don't need Windows on each system in your network (although that's the optimum setup).

To use LANtastic for Windows, you need a LANtastic network. With LANtastic for Windows on my system administrator's workstation, I can easily handle several network tasks at the same time. I can also easily change the network's shared resources with a few mouse-clicks.

With LAN utilities like this, full-time system administrators could very well become an endangered species.

—Stan Miastkowski

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Compton's NewMedia
722 Genevieve, Suite M
Solana Beach, CA 92075
(800) 532-3766
Circle 1092 on Inquiry Card.



If you've got a CD-ROM drive, you'll appreciate an electronic encyclopedia. Compton's Multimedia Encyclopedia delivers textual data with images, sound, and animation.

Compton's interface gives you a variety of ways to access information. If you have a particular subject in mind, you can go to the Finder and enter the term, or you can use Idea Search, which locates requested terms within documents. There's a Topic Tree for browsing through broad categories of knowledge and a U.S. time line for jumping right to historical events.

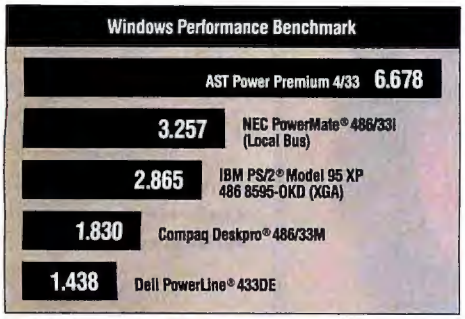
Once you find an article of interest, you can pull it into a window and browse through it. By clicking on intuitive icons (e.g., a camera or headphones), you call up images, charts, audio passages, and animated sequences. Compton's does not support hypertext-style links, although you can look up the meaning of any word by double-clicking on it.

Compton's is a wonderful research tool. It should improve your productivity at work, as long as you don't spend too much time browsing. It's a great diversion, too.

—Stanford Diehl

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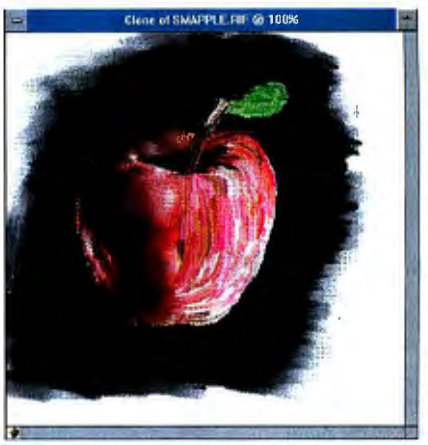


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P.O. Box 2380
Aptos, CA 95001
(408) 688-5300
Circle 1085 on Inquiry Card.

Nothing can replace paintbrushes, pencils, pastels, and pens. But Fractal Design's Painter is a remarkable digital approximation of those tools. Born on the Mac, Painter is a "natural-media" graphics package. It tries to simulate the look and feel of oil and waterpaint, chalk and charcoal, crayons, pencils, and pens. You can make paint smear, chalk smudge, ink blot, and watercolor drip. Images created with Painter have a warmer, more fluid look than you get with other packages (excluding Oasis, a forerunner of Painter).

There's a fun aspect to Painter, but it can be used as a serious package for corporate and commercial graphics. Annual reports, promotional materials, and press kits are all dressed up with colorful illustrations, usually done in natural media. With Painter, an in-house designer can send creations to a program like PhotoStyler for preparing color separations.

Painter requires 6 MB of RAM; 20 MB of free disk space is recommended. Don't try this package on less than a fast 386.

Because its tools are sensitive to pressure, Painter is best used with a stylus and digitizing tablet. You can use a mouse, but it's not the same.

Painter is the most tactile, responsive graphics package yet. Every computer artist should check it out.

—D. Barker

PHOTOFINISH



$199
ZSoft Corp.
450 Franklin Rd.,
Suite 100
Marietta, GA
30067
(404) 428-0008
Circle 1096 on Inquiry Card.

Image editing isn't always pretty. Unless you're just trying to sharpen edges or clean up noise in a scanned photo, it can be a complex operation. Programs like PhotoStyler (under Windows) and PhotoShop (on the Mac) will let you do almost anything with a digital image, but they are designed for graphics pros and have more capability than most people in the office need.

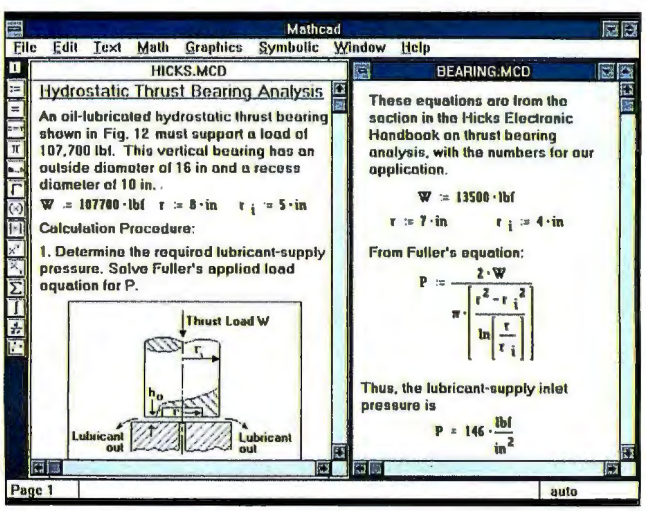
For image jobs that don't require PhotoStyler's power, I have started using PhotoFinish from ZSoft. It has the basic filters for cleaning up scanned images—color or gray-scale—by sharpening edges, adjusting brightness and contrast, equalizing color shades, erasing unwanted objects, and so on. It will convert color scans to gray-scale.

PhotoFinish isn't just for cleaning up scans, though. It has a box of tools you'd find in a paint package, including brushes, pens, pencils, paint roller, airbrush, smudgers, and color blenders. The group of selection tools has a handy pair of scissors that make it easy to cut a complex, polygonal shape in one picture and paste it into another. The magic wand, on the other hand, tends to be inaccurate.

What I like most about PhotoFinish is its ease of use and simplicity. ZSoft is targeting this package at people who aren't graphic artists but sometimes have to incorporate a scanned image into a document. As much as I like PhotoStyler, PhotoFinish is less daunting.

—D. Barker

MATHCAD



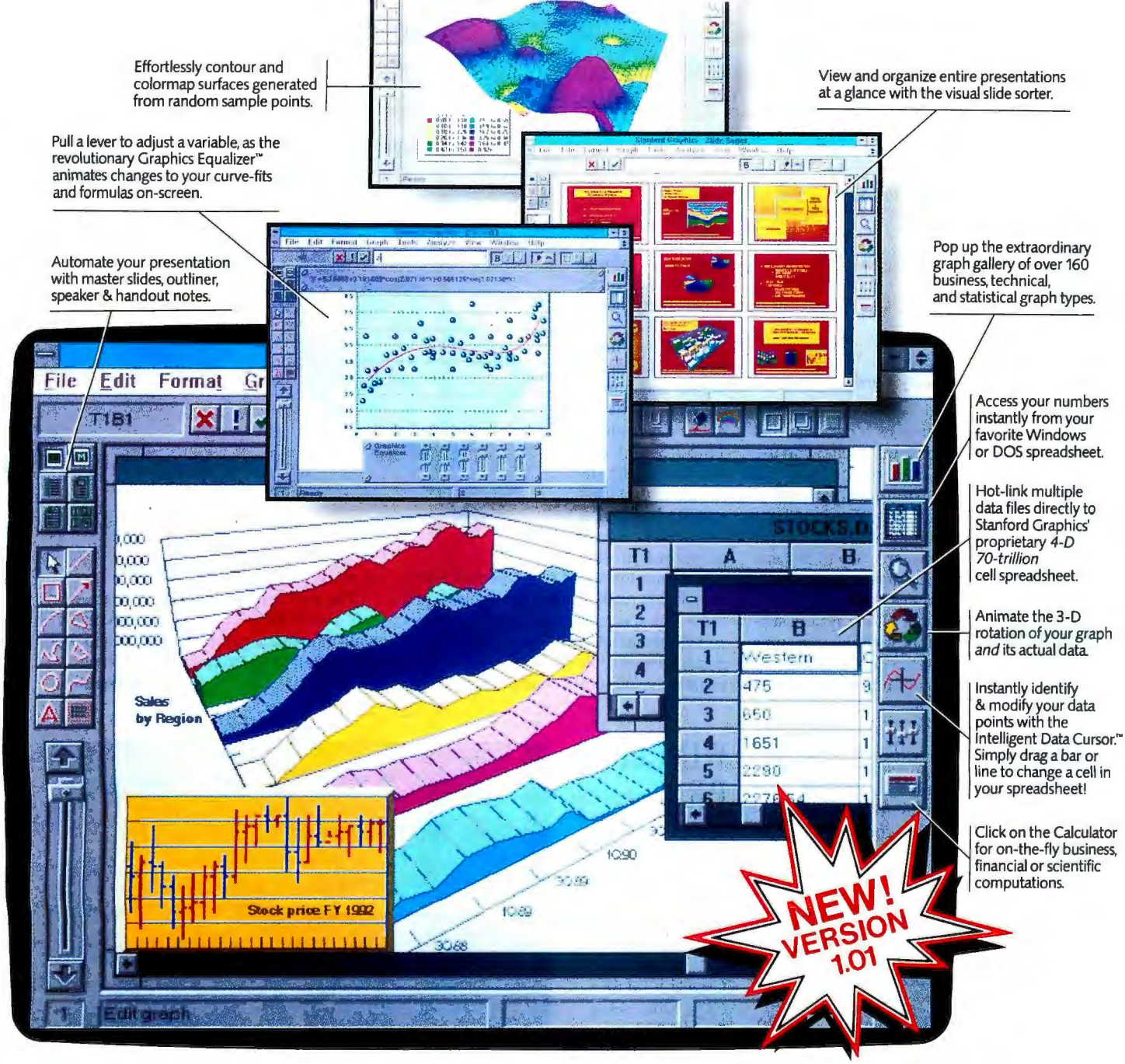
$495
MathSoft, Inc.
201 Broadway
Cambridge, MA
02139
(617) 577-1017
Circle 1097 on Inquiry Card.

Every once in a while, a PC program will come along that has the potential to increase a user's productivity by an order of magnitude. The spreadsheet was such a program. And, by the incorporation of electronic handbooks, Mathcad, a mathematical solver program, is another.

With these electronic texts, a user can take an equation, formula, or diagram from a technical reference book, paste it into a Mathcad document with one mouse-click, change the values if necessary, and then calculate the results. This certainly beats lugging those technical tomes around, not to mention having to do the math yourself.

At this point, MathSoft is offering two handbooks for use with Mathcad: Machine Design and Analysis from Tyler G. Hicks' *Standard Handbook of Engineering Calculations*, (New York: McGraw-Hill, 1985) and Shackleford's *The CRC Materials Science and Engineering Handbook* (CRC Press, 1991). The handbooks are priced at $99 and $149, respectively. More handbooks are on the way.

—Rich Friedman



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—Infoworld, Sept. 16, 1991



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WINDOWPHONE

$495
AG Communication Systems Corp.
2500 West Utopia Rd.
P.O. Box 52179
Phoenix, AZ 85027
(602) 582-7000
fax: (602) 582-7111
Circle 1095 on Inquiry Card.



WindowPhone is a package that you either love or hate; you use it all the time, or you feel it's a gross waste of valuable disk space. Basically, WindowPhone is a fancy phone dialer with some nice bells and whistles that are easy to become attached to. It connects directly to any standard telephone outlet (RJ-11).

For example, if your phone system supports Caller ID, WindowPhone pops up a window identifying the caller. A call log keeps a record of incoming and outgoing calls, including unanswered calls, even when your PC's power is off. You store phone numbers in three personalized phone directories.

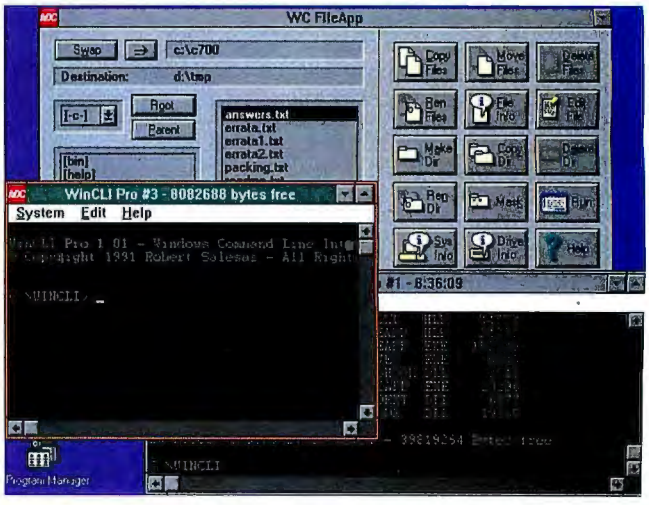
WindowPhone lets you add notes, maps, and photographs to every phone-book entry. To auto-dial any number in the directory, you just point and click your mouse. You can password-protect private numbers and block certain numbers. If you really want to get ruthless, you can assign special rings to important callers and eliminate interruptions from "less important persons." If you work in Windows constantly, WindowPhone is a handy way to marry your phone to your PC.

The package includes the software, one half-size 8-bit PC card, one 120-volt AC wall-mountable power converter, and a 6-foot standard modular telephone cord.

—Rich Friedman

WINCLI PRO

$35
Eschalon Development, Inc.
110-2 Renaissance Sq.
New Westminster, BC,
Canada V3M 6K3
(604) 520-1543
Circle 1098 on Inquiry Card.



WinCli Pro 3.0 is an inexpensive program that adds a command-line interface to Windows. But wait, you say. Why should Windows need a command-line interface?

Well, command lines can be easy to use. When I want to move an entire directory structure from one location to another, it is much easier to drag it graphically. However, when I'm removing dozens of temporary and backup files from a directory, it is much simpler to type `del *.tmp` than to select them all individually and delete.

But wait, you say again. Windows *has* a command-line interface: Just double-click on the DOS icon and press Alt-Enter. Yes, but what if I don't want to actually run DOS programs? All I want is a simple little program that lets me manipulate files and quickly launch applications.

WinCli provides a DOS syntax and command set. It also has a nice file manager, a clock, a screen saver, and password protection; I haven't opened the Windows File Manager since loading them.

WinCli's most obvious restriction is the lack of batch files or other type of scripting interface. You can always launch a DOS batch file, but the whole point, at least for me, is not to load the DOS box. Another problem is speed; WinCli writing to the screen is an exercise in patience.

Despite its limitations, I recommend WinCli Pro. It's a productivity tool well worth the investment.

—Raymond GA Côté

MORE WINDOWS

$99
Aristosoft
6920 Koll Center Pkwy., Suite 209
Pleasanton, CA 94566
(510) 426-5355
Circle 1101 on Inquiry Card.

More Windows 3.0 is one of the handiest Windows utilities, especially when I'm doing desktop publishing, since I don't have a large screen.

If you have a standard VGA screen, you can, change your view of a document or worksheet by clicking on the scroll bars, but that can be a pain. More Windows creates a virtual screen that can be up to 66 percent larger than your actual screen size. What I like best is how you move around this virtual screen; it's called *panning*. You bump the mouse against the edge of the screen, and your view moves.

Installation is a snap. It creates a MOWIN icon that lets you turn the utility on and off. More Windows won't help much with some applications (e.g., telecommunications), but I find it useful when I'm working with PageMaker under Windows 3.0.

—Anne Fischer Lent

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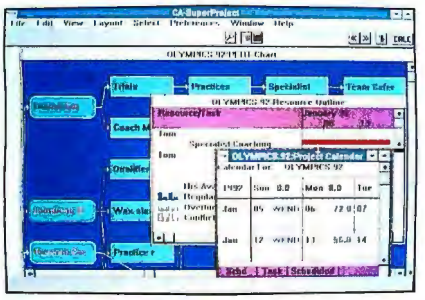


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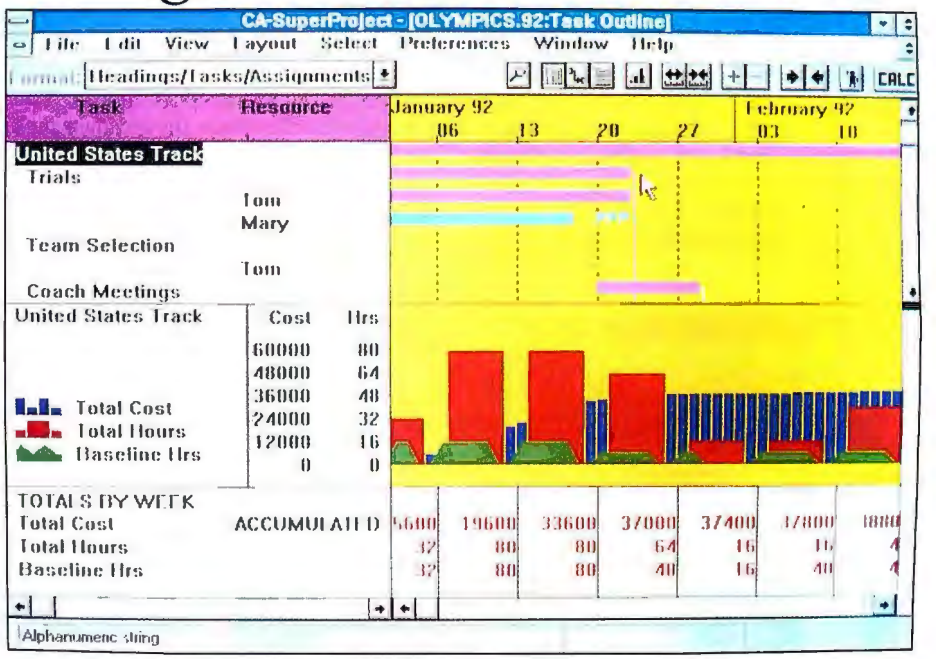


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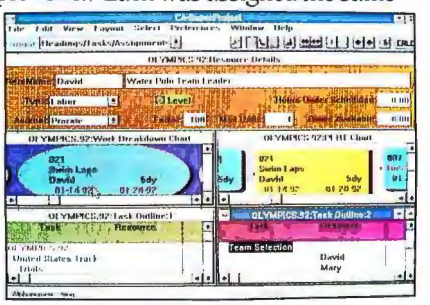


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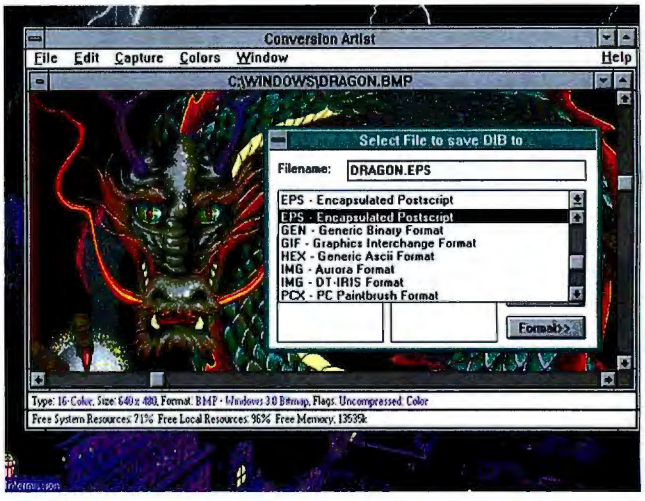
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CONVERSION ARTIST

$149.95
North Coast Software, Inc.
P.O. Box 343
Barrington, NH 03825
(603) 332-9363
Circle 1102 on Inquiry Card.



As someone who works on software reviews, I deal with a lot of screens captured from applications. Reviewers send me screen shots in all sorts of formats. But BYTE's design department ultimately wants TIFF files, because that's what it transmits to the service bureau that does color separations for the magazine.

There are a dozen good programs for converting bit-map image formats, but I've settled on North Coast Software's Conversion Artist. This package showed up one day when I was having a hellacious time turning a PCX file into a GIF file. Call it serendipity. I loaded the software and called up the misbehaving PCX. Conversion Artist brought it up on-screen in a few seconds.

Converting an image is simple. You click on the file you want and then pick the target format. If you've got a mess of files to convert, you can set them up as a batch process. Conversion Artist can handle just about any file format. In addition to the usual PC file types and MacPaint graphics, this package can also import Silicon Graphics RGB, Sun RAS, and Amiga IFF formats.

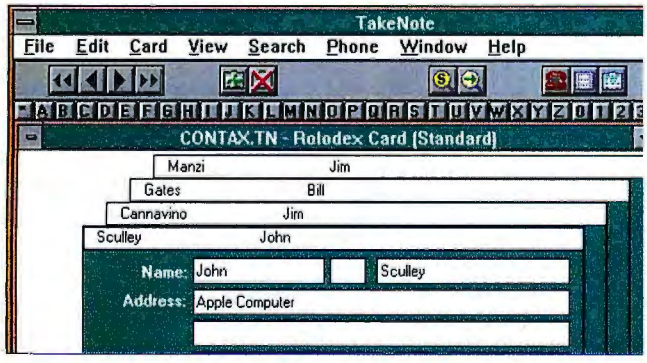
But Conversion Artist doesn't just convert images; it also captures them, grabbing either the entire screen, the live window, or a user-defined area. The package can help you save disk space by reducing the number of colors in an image (e.g., from 32-bit down to 16-bit) and by applying compression to image files.

In the world of publishing, where deadlines are always at the door like a barking dog, you need tools you can rely on. Conversion Artist hasn't let me down yet.

—D. Barker

TAKENOTE

$69.95
ButtonWare, Inc.
325 118th Ave. SE,
Suite 200
Bellevue, WA
98005
(206) 454-0479
fax: (206) 454-1838
Circle 1099 on Inquiry Card.



Of course you don't need a computer to take notes or keep phone numbers and addresses. But the right software can let you do things with those notes and numbers that you'd be hard-pressed to do with note cards. Try searching through a notebook to find every phone call in which you discussed, say, Windows software.

ButtonWare's TakeNote is the best program I've worked with yet for keeping together and sorting through the kind of data I acquire and use in a day at the office: contact names, phone and fax numbers, records of conversations. It's an electronic card file and notepad combined. All information is kept on cards, which have labeled fields for names, addresses, phone numbers, comments, and so on. (There's also a field for birthdays, which seems silly.) Besides cards, there are templates for business cards, credit cards, inventory (e.g., software, music, and videos), personnel records, recipes, and free-form notes.

Once you've got the information—those hundreds of business cards collected at Comdex, for example—into the program, you can search through it with the press of a button. The search engine looks for any text in any cards and can even search on the basis of "sounds like." TakeNote will also dial numbers for you. (Just click the red phone icon at the top of the screen.)

TakeNote looks like a stack of cards, is easy to figure out, and works smoothly. Without this program, my desk would be even messier than it is.

—D. Barker

THE FAR SIDE COMPUTER CALENDAR

$69.95
Amaze, Inc.
11810 115th Ave. NE
Kirkland, WA 98034
(206) 820-7007
fax: (206) 823-0568
Circle 1130 on Inquiry Card.

It took syndicated cartoonist Gary Larson to make us jaded keyboard crunchers crack a smile. The Far Side Computer Calendar puts some fun into the start of another working day.

Larson's admittedly quirky humor isn't for everyone; you either love Far Side humor or hate it. Somehow, however, I have a hunch that Far Side humor is a perfect match for most serious computer users.

Amaze realized that folks wouldn't lay down the bucks for computerized comics. So, it made its program *do* something. The Far Side Computer Calendar is a full-fledged calendar that's full of surprises: from animated icons of ringing telephones and flying airplanes to randomly appearing animations (my favorite is the iceberg full of penguins that floats across the screen).

The Far Side Computer Calendar is available in Windows, DOS, and Mac versions. To my mind, it's one of the essential computer programs.

—Stan Miastkowski

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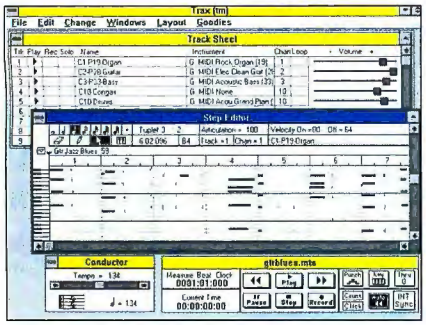
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Circle 321 on Inquiry Card.



TRAX

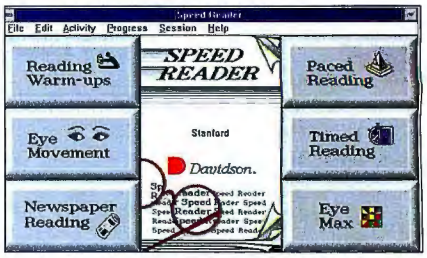
$99
Passport Designs, Inc.
100 Stone Pine Rd.
Half Moon Bay, CA 94019
(415) 726-0280
Circle 1103 on Inquiry Card.

I am living proof that Passport Designs has created a MIDI recorder and sequencer for nonmusicians. I bought the low-end Trax sequencer because it works with Software Toolworks' Miracle keyboard, a full-size MIDI keyboard that connects to a PC's serial port. Trax's Miracle drivers let you record from the keyboard and play MIDI recordings through the Miracle's built-in speakers.

At its most basic level of operation, Trax works like a tape recorder. You click on familiar buttons (e.g., play, record, rewind, and fast forward) to record and play back. Trax gives you control of 64 recording tracks. You can select a MIDI instrument by name to record on each track, and you can then play back any combination of tracks. You can insert, delete, or edit notes of individual tracks and can cut and paste blocks of notes or move them around with the mouse. Double-clicking on the note brings up the Edit Note dialog box, where you can numerically set a note's start time, pitch, and duration.

Even if you can't play a lick, Trax is great fun. The program comes with a set of canned pieces that you can edit and rearrange. A real musician will probably opt for the professional version of the program (Master Trax Pro), but novices can do fun and useful work with Trax alone.

—Stanford Diehl



SPEED READER

$49
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P.O. Box 2961
Torrance, CA 90509
(800) 545-7677
Circle 1104 on Inquiry Card.

Since I was a kid, I've wanted to read like Bookworm on the *Batman* TV series—almost as fast as I could flip the pages. At last, with Speed Reader from Davidson, I'm on my way. The program, which aims to double or triple your reading speed, preaches the method of reading groups of words instead of plodding along a word at a time.

After assessing your current reading speed and comprehension, the package tries to increase your peripheral vision so that you can read several words at once. The program provides a series of warm-up exercises to get your eyes ready for speedy reading. You fix your vision on a black dot displayed on-screen; then a group of words flash on. By keeping your eyes trained on the focal point, you must rely on your peripheral vision to see the groups of words. There's also a group of eye games designed to broaden your range of vision.

Another component of the program scans through a selected passage of text, highlighting word groups. This not only forces you to read at a programmed pace, it also trains you to read words in groups. After displaying the passage, the program asks some multiple-choice questions to test your comprehension.

This is a fun program with a noble goal. Anyone can become more productive by increasing reading speed and comprehension. The reading selections are a bit dry—they're reminiscent of the aptitude tests we all took in grade school—but you can import your own selections or even read from a book while the program times you. With its professional software design and proven training philosophy, Speed Reader should sharpen your reading skills in no time. ■

—Stanford Diehl



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JIM KINLAN

EIS MOVES TO THE DESKTOP

Executive information systems help you identify key business trends, data relationships, and exceptions



A new crop of Windows-based products allows you to view, analyze, and report on vital business data existing in a variety of formats, from IBM's DB2 in the mainframe's data bank, to Oracle on the department's file server, to Lotus 1-2-3 on your PC's hard disk. These products are called executive information systems.

An analogy to an EIS would be the Sunday newspaper section that focuses on the events of the past week. This section pulls together stories from a variety of sources, makes them understandable, and provides underlying news analysis. An EIS provides similar benefits to company managers at all levels by providing software tools that retrieve company data from many sources (mainframe, minicomputer, LAN servers, and local PCs) and present this data clearly. Unlike the static newspaper, however, EISes let you scan the data headlines, selectively "drill down" (in hypertext fashion) on a headline to see more information, combine this data with other data, and make more informed decisions based on data that is constantly being updated.

Originally intended to replace inch-thick paper reports, EISes were first designed as specialized mainframe applications, with costs starting at $100,000. But the explosive growth of PC LANs has radically altered the EIS landscape. The new realities of the marketplace have challenged the efforts of traditional EIS suppliers to keep pace.

The three products reviewed here have different roots. PowerPlay 2.0 from Cognos and Lightship 3.01 from Pilot Software came from mainframe- and minicomputer-based companies; Forest and Trees for Windows 2.0 from Channel Computing was designed by a company specializing in PC-based solutions.

While EISes may appear to package information simplistically, the fact is that a colorful, graphical environment helps you not only to better understand the data but also to convince others of your point of view. So it's not surprising that all three products run under Microsoft Windows.

Getting Started

Deciding to go to EISes is not a sudden decision for most companies. Instead, it is a growing corporate-wide understanding that managers need specialized data quickly and presented in a clear, easily adjustable format. For example, a sales manager wants to be able to see data by channel and by product. Unwilling to wade through the swamp of printed reports, the manager wants to get to the bottom line as quickly as possible. In a competitive business environment, it's imperative to be able to quickly identify key business trends, data relationships, and exceptions to your plan. (See the text box "EIS in the Real World" on page 210.)

Once the need is identified, other fundamental requirements for the success of an EIS include

- identifying an individual who has a thorough familiarity with the company's data assets;
- gaining the interest, attention, and creativity of the organization that will use the system;
- management's committing to the project's success as well as to its ongoing maintenance; and

ILLUSTRATION: BARTON STABLER © 1992

- devoting programmers to design and create the user-specific application.

First Looks

A lot of tools let you simply retrieve the data that resides on a variety of platforms in different formats. For the purposes of this review, however, I have defined an EIS as having specific capabilities: It can

- perform data retrieval across a wide range of platforms and data formats;
- analyze data in a variety of ways;
- graphically present the information;
- create ad hoc reports; and
- contain customized application-development tools to build an application that automatically performs routine tasks.

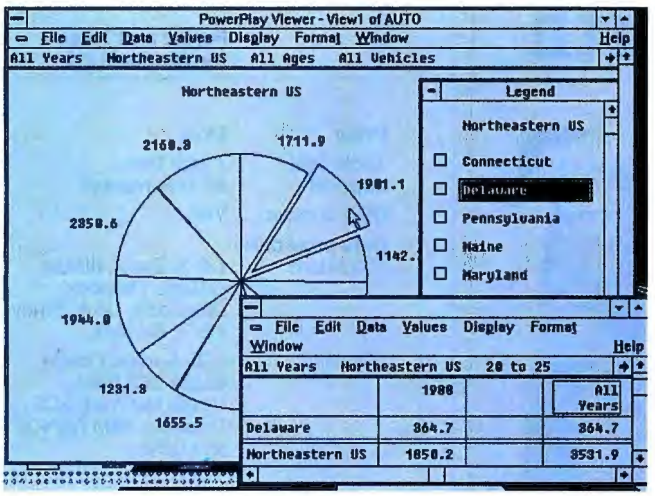
All three of the reviewed products provide simple data access, and none has the ability to change data at its source. Each retrieves the data that it works with in a fundamentally different way—a factor that you should consider carefully when you determine whether a program's data model meets your system's goals.

PowerPlay (see screen 1) is especially different from its counterparts, since you develop a specialized database using the PowerPlay Creator tool. Using two input files—a summarized data (.DAT) file and a definition (.DEF) file—the program extracts data elements from a variety of files and locations. It can extract virtually any file format as long as you can convert the file to a flat ASCII file format (this could include DB2, Oracle, or Lotus 1-2-3 files).

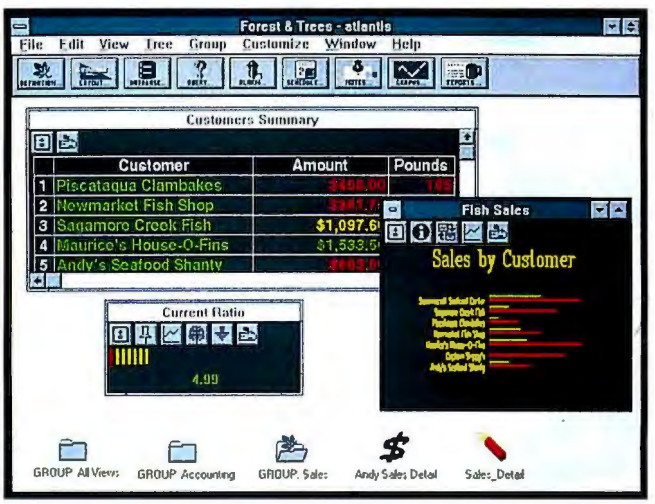
The resulting data extract, or "bucket of information," from PowerPlay lets you explore the data from any perspective and perform searches with predictable response times. It lets you download this extract on as regular a basis as is practical, but it provides no links to the original data sources.

Since there are no live links, the PowerPlay method is not recommended if you need to work with up-to-the-minute information or if the extract may not contain all the information you're likely to need to query. Rather, the PowerPlay model is ideally suited for organizations whose data is updated on a weekly or monthly basis. With this product, you can eliminate many thorny issues associated with on-line data access, such as who has the rights to access production files and how live data links may degrade network performance.

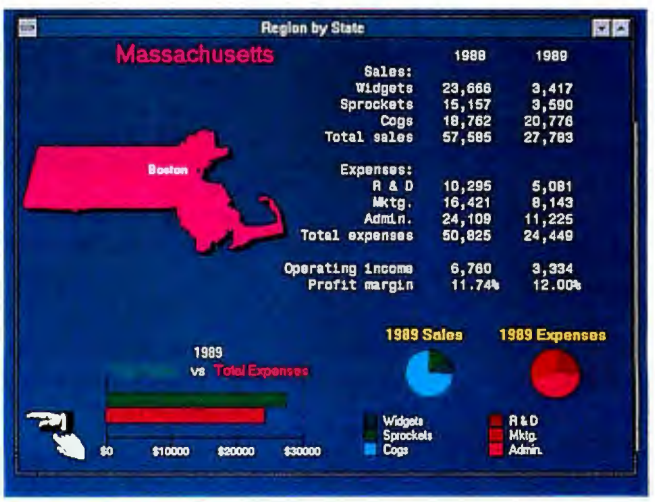
Forest and Trees' data-access method



Screen 1: *PowerPlay extracts data from a variety of files and locations and deposits the information in a specialized user database.*



Screen 2: *Designed to run like an electronic dashboard monitoring company data, Forest and Trees alerts you when certain predefined data conditions exist.*



Screen 3: *Lightship provides a comprehensive range of file and network support to live data.*

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EXECUTIVE INFORMATION SYSTEMS COMPARED

A variety of different features and data types supported highlight these EISes.

	Forest and Trees for Windows 2.0	Lightship 3.01	PowerPlay 2.0
Price	$495	$750	$850
Technical support	1 year free; toll-free number	90 days free; toll line	$130 per year; toll-free number
DDE support	Yes	Yes	No
Data providers			
Standard	1-2-3, Excel, dBase, R:Base, Paradox, DataEase, Q&A, Btrieve, ASCII flat files	DDE links	Any ASCII flat file
Optional	SQL Server, Oracle, Gupta SQLBase, Novell NetWare SQL, Teradata, IBM AS/400 and DB2	With Lightship Lens: dBase, Paradox, Oracle, SQL Server, Sybase, DB2, Novell NetWare SQL, text files	None
Platforms supported	Windows, DOS	Windows	Windows, Macintosh
On-screen alarms	Yes	No	No
Data model	Live links	Live links	Extracted data bucket

is 180 degrees from PowerPlay's. Channel Computing's corporate mission is to help you find your data and access it where it lives. Thus, all the data links are with live data. Designed to run like an electronic dashboard monitoring your company's data, Forest and Trees (see screen 2) runs as a background task to alert you when certain predefined data conditions exist.

Forest and Trees comes standard with data providers for common data formats, such as Lotus 1-2-3, Microsoft Excel, Borland dBase, Borland Paradox, and ASCII (see the table for a complete list). Optional data-provider links are also available for Microsoft SQL Server, Oracle, Gupta SQLBase, Novell NetWare SQL, and IBM AS/400 and DB2 formats.

Setting up data-provider links is the task of the application builder. As difficult as it might seem to do this, Forest and Trees relieves most of the connection pain. To establish the connection, you open the database view, identify the location of the file, and fill in the necessary information about the appropriate log-in procedure and password protection.

Like Forest and Trees, Lightship (see screen 3) constructs live links to data, but its data gateway is different. The base version of Lightship relies solely on the DDE protocol of the Windows 3.x environment.

Since this method is limited to accessing data from other applications that support DDE, such as Excel, Pilot Software has

BYTE ACTION SUMMARY

- **WHAT EXECUTIVE INFORMATION SYSTEMS DO**
  EISes collect and analyze company data from many sources (mainframe, minicomputer, LAN servers, and local PCs) and present it in an easily understandable way.
- **LIKES**
  EISes let you scan the data headlines and then selectively drill down on a headline to see more information.
- **DISLIKES**
  Lightship's use of DDE is more restrictive than it may seem; to date, few applications have full support for DDE.
- **RECOMMENDATIONS**
  If you need live data links, Forest and Trees provides the widest and most versatile range of data support. It's also the least expensive of the reviewed products.



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EIS in the Real World

In contrast to the earlier generation of mainframe-based executive information systems, today's EISes have been designed to work in a decentralized mode, with the desktop PC as the primary analytical engine. Despite these advances, EIS success stories are still the result of pioneering efforts by those who can see the bottom-line benefits.

In many ways, EIS successes are more difficult to achieve today than ever before. Many companies now have data distributed over many different databases, locations, and hardware platforms. Pulling it all together into a coherent whole requires coordination at many levels, but the rewards can be worth it, according to those who have made the effort.

Texas Instruments

With Lightship, the TI (Texas Instruments) plant-automation facility in Hunt Valley, Maryland, has been able to switch from damage reporting to damage control. Before TI implemented Lightship, information was spread around in a variety of reports, and it was difficult to anticipate problems. With the EIS, managers and engineers at many levels (e.g., cost center, project, and site managers, and chemical and hardware engineers) can control spending on both internal and R&D projects.

The main office used to run a series of damage reports to find out what had gone wrong when costs for the process-automation systems were out of line. But since the reports were run after the fact, it was too late to do anything to fix the problems. Now, with Lightship, the managers can control and track costs as they occur, and they can perform damage control in real time by exploring regularly updated project information.

Using a hot spot on the screen (i.e., an area that has been programmed to perform other actions when you click on it), managers can "drill down" (in hypertext fashion) from the project level to the actual cost elements and compare budgeted dollars to actual costs as they occur. Thus, they can see not just how much money is left in a certain budget but whether or not the money is going too fast.

Lightship interfaces with an Oracle database on a DEC VAX system, a local inventory system, and IBM mainframes in TI's Dallas, Texas, facility. The EIS uses a DEC PathWorks network and 386s running Windows. (The Hunt Valley plant changed to Windows for Lightship; programmers with no Windows and little SQL [Structured Query Language] experience performed the implementation.) Lightship Lens was not available at the time of installation, so the plant used Q&E, which performs the necessary functions; the company has seen no reason to switch over.

Despite advances, EIS success stories are the result of individual efforts.

TI considered several packages before making its choice. Forest and Trees has a hierarchical tree structure and didn't allow the kind of "slicing and dicing" that TI needed. PowerPlay required detailed data definitions, while Lightship does not. TI is pleased with its choice of Lightship, but the company is aware that current versions of the other products may no longer have the difficulties it found when evaluating them.

The only real problem TI has run into with Lightship has been with performance—a subjective problem, in this case. Most of the performance problems have been linked to variances in the network. But for some users, the 5- to 8-second response time for an EIS report request seems slow. TI was quick to point out, however, that in the past such reports would have taken days to compile.

As for a wish list of changes or new features, the only prominent item on it would be a completely ad hoc query tool. SQL, it seems, has some limitations. For one thing, it can't do cumulative adds, and TI would find that ability helpful. Instead, people work around the constraint with Q&E.

The change from damage reporting to damage control that Lightship made possible is one of taking control of your information. It is the difference between acting and reacting.

Dr Pepper

The Dr Pepper/7Up Companies use PowerPlay to give upper management access to sales and demographic data at the company's corporate headquarters, located in Dallas, Texas. The EIS accesses relational database files residing on several VAX machines from DEC. PowerPlay runs on PC compatibles on a Novell network.

Dr Pepper uses PowerPlay to generate monthly, yearly, and package reports for its field-sales executives—reports that replace headquarters-generated paper reports. PowerPlay's extracted database is updated monthly and then downloaded from a VAX to the regional PCs. This monthly extract allows the field-sales offices to evaluate the sales performance of local bottlers. Since the extracted regional data files are less than 2 MB in size, the local office can optionally load the data onto a portable PC to graphically review and report the data at the customer site.

While PowerPlay does not contain live data links, Cognos has a package that Dr Pepper uses, called Database Host Connector, that provides some of that functionality. With PowerPlay, Dr Pepper sales executives can complete most reporting functions in the field. The program has also eliminated a considerable amount of rekeying of information.

Dr Pepper has no problem with the response time for the system, but the

company would like to see some improvements in the product. One such improvement would be to fully automate the process of definition file automation. Another would be to add triggers or alarms to PowerPlay to indicate when certain exception conditions occur.

On the whole, however, Dr Pepper is very pleased with PowerPlay. The product has proved to be a timesaving, flexible aid to decision making.

Heidelberg Harris

Formerly called Harris Graphics, Heidelberg Harris's Webb printing-press plant in Dover, New Hampshire, was an original beta-test site some years ago for Forest and Trees. The EIS accesses a Novell NetWare network of 800 clients and 50 servers, plus an NCR 9800 and 80 Hewlett-Packard 9000s running Unix on a WAN (wide-area network).

The company uses Forest and Trees for a wide range of corporate applications that require the use of live data links. One of them, which Heidelberg Harris calls Cop on the Block, monitors the status of orders in the manufacturing process. Job-related data is "swiped" through magnetic card readers and entered into an Oracle database that Forest and Trees accesses.

Cop on the Block enables top-level and operations managers to obtain financial, factory, and attendance information through database querying and reporting on information such as budgeted costs versus actual costs and other accounting information. Forest and Trees' alarm capabilities provide exception notification. For example, Heidelberg Harris has one alarm set to notify managers when any of their employees are more than 1 hour late to work.

The EIS project coincided with the firm'sefforts to downsize its mainframe applications to those built around PCs and networks—a client/server distributed environment. Forest and Trees enables Heidelberg Harris to insulate its users from the change by maintaining a single view on the data while the machines change. Because Forest and Trees can access so many different file types to obtain information, you never even know that the underlying hardware is different—the view that you see remains the same.

In addition, since queries are easy to formulate under Forest and Trees, the users can take over this function from the MIS department, after a period of adjustment. Then, when the MIS department develops new applications, it has less work to do. It only needs to write the transaction-processing functions; the users then write their own queries.

Heidelberg Harris has had a few minor problems with Forest and Trees. They amount more to suggestions for future improvements than to actual complaints.

The average response time for a query is not a problem. For example, a query of 3200 records that joined four tables required just 17 seconds to complete. Response time becomes a problem only when someone requests an "order by" index for a nonexistent index. Then the system must check some 200,000 records, and the response is so poor that the terminal locks up for about half an hour. You can reboot to free the terminal, but the transaction continues to process in the system, consuming processor time. Notification that the index requested does not exist would be in order.

Another minor problem exists with the Query Assist function: It doesn't handle complicated data names (e.g., multipart hyphenated data names) well. They may be rejected, requiring manual alterations, such as the insertion of quotes.

In the way of a wish list, Heidelberg Harris thinks that it would be more efficient if Forest and Trees did its sorting at the client system, not at the server. This change would provide more flexibility in setting up reports (you could decide on the sort order after you see what the data looks like) and would save bandwidth, since you wouldn't have to request multiple transmissions of data for different sort orders.

developed a Lightship add-on called Lightship Lens to provide access to popular file types like dBase, Paradox, SQL Server, and DB2. Lightship Lens passes information back and forth from these files to Lightship with the DDE protocol or through DLLs.

Using DDE has advantages and disadvantages: You will like the automatic update of information from one application to another; but for the DDE connection to work, all the applications must be memory-resident. And the simple reality remains that few applications fully support the DDE protocol.

Each of the reviewed programs has selected substantially different approaches to building and accessing data for analytical use. If you don't require live data links, the PowerPlay extracted data bucket may be the most flexible model, since it has the extra benefit of providing predictable response times from a data extract that could come from a variety of data formats. But this approach also tends to isolate you from the actual data source, so it comes as no surprise that Cognos has announced a new product, called Impromptu, to provide SQL (Structured Query Language) links to live data.

If your company requires live links to data or wants to make ad hoc inquiries to a wider universe of data, then Forest and Trees provides the widest range of data support in its base package. Lightship, however, bolstered by Lightship Lens, also provides a comprehensive range of file and network support to live data.

Explorative vs. Predictive

While data access is a fundamental design item for the system implementer, a program's ability to present, analyze, monitor, and report on the data is what differentiates its functionality for you. With an EIS, you typically begin by looking at a summarized big-picture view of the data, such as sales volume by all products, and then drill down to more detailed data items, such as sales by product by state by channel.

PowerPlay's strength lies in its ability to "slice and dice" information in myriad ways. However, since you must explore the data and perform all of the data analysis, the program's benefits are limited to your skill and intuition. To its credit, PowerPlay's user interface is cleanly defined, and its concise, colorful documentation overcomes the fears of even the most uninitiated.

As you navigate the data, PowerPlay's pointing cursor changes to a cross when it's over a data element that you can drill down on to inspect more detailed levels. You can alter the data view with a simple

menu command. For example, if you want to see syrup sales by region in a stacked bar graph (or six other graph types), you click on the menu item; if you want to change the data to a crosstab view, you click on that menu item—you can even swap the rows and columns. If you prefer percentages to sales numbers, you select that menu command. When you finish with the data analysis, you can use a similarly flexible reporting tool to create a range of reports.

Monitoring Live Links

Typically, to build a Forest and Trees application, some familiarity with SQL and networks helps. You must define specific queries that result from studying and evaluating the system. The result of each query is a *screen view*, the basic element of Forest and Trees. The view can contain a single value (e.g., total inventory), a list of values (e.g., top 10 salespeople), or a graph (e.g., the top-selling products by sales volume). You must define the data conditions that will trigger certain alarms, who should have access and to which data views, the way to display the data, and how often to query the data to ensure that it is current.

You can create a prototype Forest and Trees application in a matter of days using SQL statements. If you don't know SQL, the program provides substantial help—a Query Assist function lets you simply pick the function and data elements and even test the query to ensure that the expected value is returned. For example, to define a screen view that would order sales representatives by sales dollar performance, the query might look like this:

```
"SELECT SALESNME, TOTSALES,
FROM CMPSALES, ORDER BY
TOTSALES"
```

Forest and Trees excels with applications that need to monitor data closely and set alarms for exceptions. Neither of the other programs comes close to its electronic-dashboard monitoring features. In addition, it can augment its preprogrammed applications by submitting ad hoc SQL queries against the live database.

On the downside, however, ad hoc SQL queries can be prone to problems. Sending a poorly constructed query against live data files can degrade the server's performance while locking you out from doing any other work until it completes.

Emphasis on Graphics

Lightship also links queries to live data sources. It relies on DDE to access its data, or on an intermediary link, such as Lightship Lens or Q&E (a software program from Pioneer Software, Raleigh, NC), to provide the DDE passageway for standard data sources.

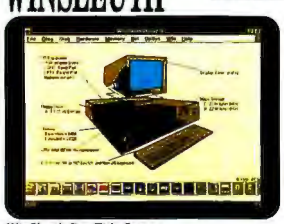
The cornerstone of Lightship is its highly graphical environment, superior to both PowerPlay's and Forest and Trees'. With a modest amount of work, you can design brilliant Lightship applications. You begin with a blank screen and manipulate objects on it to create the look you want. You can shape and size text, graphics, and data into each of the designed objects. You can even incorporate images (.BMP and .PCX) onto the screen for applications ranging from human resources' photo of an employee to the map of a sales territory.

An area of the screen can also define a menu or a *hot spot* (an area of the screen programmed to perform other actions when you click on it, as with a macro). To detect hot spots, you must look for the radio buttons on the screen or notice when the cursor changes from a pointing device to a pointing finger.

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With Lightship, hot spots aren't hardwired. They are data-driven, so, as you click on a hot spot, it can perform the same task that a menu item might otherwise do, or perhaps perform some mathematical function. For example, you might be able to drill down from an image of the East Coast region to the East Coast sales figures by product line, and then again to the sales by state.

While Lightship's application development is not difficult, it requires substantial up-front effort, defining how the application should look and operate. Lightship provides object-oriented drawing tools for creating the screens and objects.

Pilot Software encourages building applications with a minimum number of graphical screens—Lightship applications are simply a series of .LSFs, or Lightship Screen Files, that have data connections with one another. This economical approach allows you to flexibly add people or departments or to change sales regions with little or no modifications to the original design.

Which One Is Best?

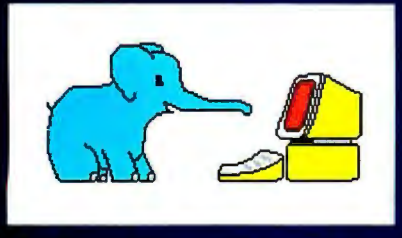
Choosing the program that best suits your needs requires careful planning and evaluation. It is impossible to recommend one package over another without knowing the requirements of a specific installation. PowerPlay gives you great flexibility in exploring an extracted bucket of information. Forest and Trees monitors corporate data like an electronic dashboard and alerts you when certain conditions or exceptions of your choosing exist. And Lightship's highly graphical front end lets you click on hot spots to see underlying data and relationships.

When you complete your evaluation, start small and provide enough time to do a prototype of the initial application. New and creative needs will evolve quickly as you begin to use the program. Expecting to make all the right choices the first time you run it is unrealistic; a successful EIS installation is the end result of an iterative process. However, using an EIS promises to significantly alter the way you look at data, how you work, and how you compete in the 1990s. ■

Jim Kinlan is a PC software marketing consultant living in Concord, Massachusetts. You can reach him on BIX c/o "editors."

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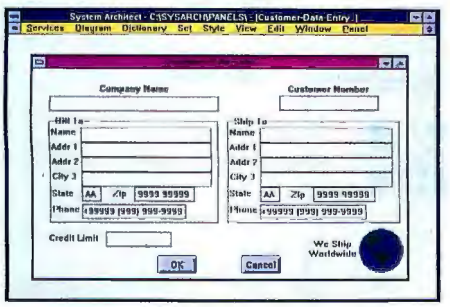
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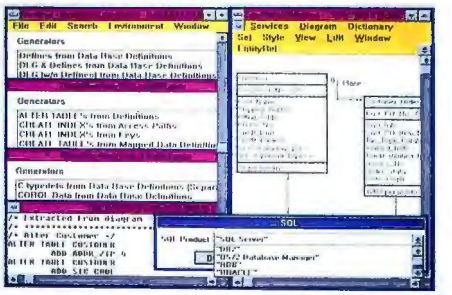
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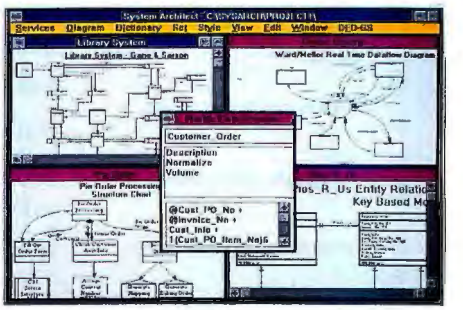
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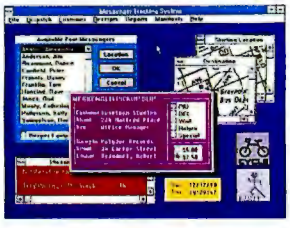


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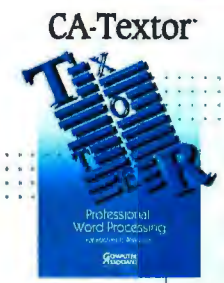
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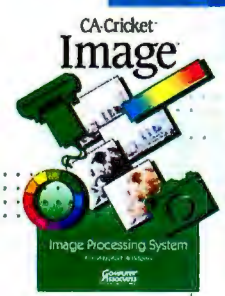


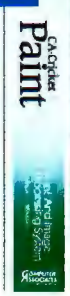






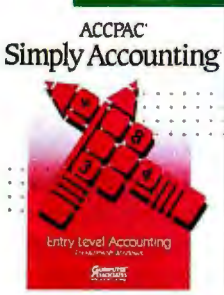


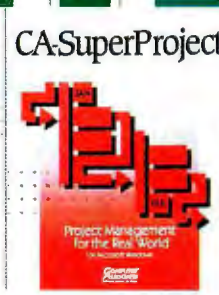


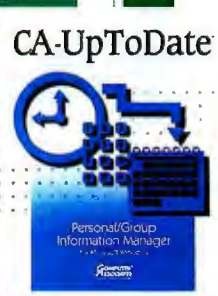












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IMAGE MAGIC

Scan, compose, enhance, retouch, and print color, gray-scale, and black-and-white images

Color bit-map image-editing products for Windows bring some of the sophisticated capabilities of expensive color-prepress workstations to the desktop. While photographers and graphic artists are the primary users of these packages, you can use images prepared with them in desktop publishing, in presentation graphics, and for photographic purposes (see the photos). You can create slides, prints (on a transparent—for overhead projection—or opaque base), negatives, or color separations for four-color printing.

I recently looked at three of these products: PhotoStyler 1.1 from Aldus (Seattle, WA), WinRix 1.1 from Rix SoftWorks (Irvine, CA), and Image-in-Color Professional 3.0 from Image-in (Minneapolis, MN). All three support multiple documents, DIBs (device-independent bit maps), button bars, the Clipboard, and pull-down menus.

Virtual memory in 386 enhanced mode enables you to work with multimegabyte bitmap images. The Windows printer drivers allow easy support for high-end output devices, such as PostScript imagesetters, even when you don't have one attached to your computer. Inactive image windows can be reduced to icons.

Image windows can contain true duplicate copies of the same image, a different view of the same image, or another image.



"Zoe," "Dutch Sunflowers," and "Nymph" (counterclockwise from left) are all true color RGB (24-bit) images. "Zoe" and "Dutch Sunflowers" were scanned from 35mm slides; "Nymph" was created with PhotoStyler. On the flowers, I used a circular selection, centered on the flower, inverted the selection, and cleared the rest of the image to black. I then set the background color using the eyedropper and used the magic wand to select the various leaves and clear them. Zooming in, I used the eraser to clear petals from the other flowers and other unwanted material. For the image of the young woman, I again used a circular selection, but I copied the selection to the Clipboard. Then I used Mask Export and Mask Import to copy the selection circle to the center of the edited flower. The girl's face was pasted from the Clipboard into the selection. The file was saved as a compressed TIFF; the image size was 694 KB, and the file size was 341 KB.

IMAGE EDITORS COMPARED

A variety of features is available with each of these packages. Choosing one is often a matter of balancing necessary and desired features against price.

	Image-in-Color Professional 3.0	PhotoStyler 1.1	WinRix 1.1
Calibration			
Scanner	No	No	No
Display	No	Yes	No
Printer	Automatic	Manual	No
Prescan	Yes	Yes	Yes
Scanning activation	Dialog box or button bar	Dialog box	Dialog box
Scanners supported	Microtek, Sharp, and Epson	Microtek, Sharp, Kodak, Epson, HP, and Nikon	Sharp, Epson, and HP
Button bar			
Positioning	Fixed to left of window	Anywhere in window or hidden	Anywhere in or out of window or hidden
Number	One	Two	Two
Type	All	Paint, Select	Raster, object
Selection tool placement	Dialog box	Button bar	Button bar
Geometric tools	Lines, ellipses, rectangles, open and closed Bézier curves, polygons	Lines	Lines, ellipses, rectangles, Bézier curves, polygons
Text	Bit map	Bit map	Object
Typeface selection	Slider for entire alphabet	Letter of your choice	No sample
Changing scan resolution	Yes (no scaling)	Yes (with scaling)	No
Image-enhancement gamma functions	No	Yes	No
Image portion selection tools	Rubberband rectangle, square, ellipse, circle, irregular area, magic wand, single line of pixels	Rubberband rectangle, square, ellipse, circle, irregular area, magic wand, single line of pixels	Ellipse, lasso, rectangle, magic wand
Soft Edge depth	32 pixels	5 pixels	No limit
Color-matching standards	No	No	No
File formats supported	IMG, PNT, Targa, PCX, GIF, TIFF, and BMP	Targa, PCX, GIF, TIFF, and BMP	WMF, Targa, PCX, GIF, TIFF, RIX, and BMP
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Price	$795	$795	$495

Multiple views let you show different magnifications of an image, zoomed in or out. You can also scroll around an image that's larger than its window by using horizontal and vertical scroll bars.

I evaluated the packages on three systems:

- a standard VGA-equipped 20-MHz 386 with a 14-inch analog monitor, 8 MB of RAM, a mouse, and 30 MB of available space on a 116-MB IDE hard disk;
- a 33-MHz 486 with 16 MB of RAM, a mouse, a 700-MB hard disk, Super VGA (at 1024 by 768 pixels), and a 15-inch multiscan monitor; and
- a 33-MHz 386 with 12 MB of RAM, a trackball, 1024- by 768-pixel Super VGA, and a 15-inch multiscan monitor.

Connected to the 486/33 were Microtek ScanMaker 600Z flatbed and 1850 35mm transparency (slide) color scanners. Later, I connected a Mitsubishi 20-inch multiscan monitor and a Mitsubishi 3600-30 300-dot-per-inch dye-sublimation color printer to the 386/33. The 486/33 and 386/33 are part of a Novell network with about 1 GB of available space on the server.

During this review, I generated about 100 MB of images. Based on my experiences, I recommend certain minimum configurations with these products. A 386 is a must, with at least 60 MB of available disk space prior to installing the image editor (to leave room for the Windows swap file and a few moderate-resolution images).

In addition, 4 MB of RAM is a practical minimum when working with scanned images at a modest display resolution, such as 640 by 480 pixels—8 MB for better performance and larger images. To work more comfortably with larger images, you would want 16 MB of RAM (or more if you use Windows 3.1). Image files tend to become gigantic, so more (fast) disk space is always helpful.

Scanning Images

To bring photos into the PC, you scan them with an image-editing program. All three of the programs discussed here activate a dialog box for scanning from a pull-down menu entry. Image-in-Color Professional also has a scan tool on the button bar. Since WinRix does not support Microtek scanners (see the table), I couldn't do a hands-on evaluation of its scan capabilities.



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BYTE ACTION SUMMARY

- **WHAT IMAGE EDITORS DO**
  Windows 3.x–based image editors scan, compose, enhance, retouch, and print color, gray-scale, and black-and-white images.
- **LIKES**
  The functionality of these products opens the color frontier to a world of image magic on the PC.
- **DISLIKES**
  None of these products implements any color-matching standards—a potential problem when dealing with scanners, monitors, and printers.
- **RECOMMENDATIONS**
  For the most versatile panorama of color image-editing functionality under Windows, PhotoStyler wins "best-of-three."

All three products support a quick prescan. This is a low-resolution gray-scale or black-and-white scan that's much quicker than a full-color, full-resolution scan of the entire area. You just drop a rubberband-style box over the area. This worked in my tests of PhotoStyler, but not with Image-in-Color Professional, although it has the feature. I called the company and was told that for a flatbed scanner, Image-in-Color Professional needs a new driver that should be shipping by the time you read this. All three products let you scan three types of images: color, gray-scale, and "bi-level" (i.e., black-and-white).

Both PhotoStyler and Image-in-Color Professional support changing resolutions, but the latter does not support scaling (i.e., percentage resizing) at scan time. PhotoStyler also supports image-enhancement gamma functions at scan time to lighten shadows or darken highlights. Gamma functions are more useful when scanning from film (negatives or transparencies) than from a print, since such compensations can be made in the final print.

When you're working with photographic images, consistency in the representation is important. None of the three products I looked at implements any color-matching standards. This becomes an issue in dealing with the different devices in the process: scanner, monitor, and printer. Standards range from a gray-scale card to the Macbeth Color Checker to the Pantone process colors used in color printing.

PhotoStyler supports display calibration, known as *gamma correction*, and provides a method for determining the gamma values for each of the RGB channels. Both PhotoStyler and Image-in-Color Professional support gamma correction for a printer. Image-in's package provides an automated printer-calibration process; PhotoStyler, a manual one. WinRix does not support printer calibration.

None of the three supports calibration for scanners; if it's required, you'll have to correct the images individually with Tune Gray/Color. In contrast, Micrografx Picture Publisher (which I received too late to fully review for this article) provides a color and gray-scale calibration process for scanner, printer, and display.

Changes and Modifications

While all three products are intended for manipulating true color RGB (24-bit) bit

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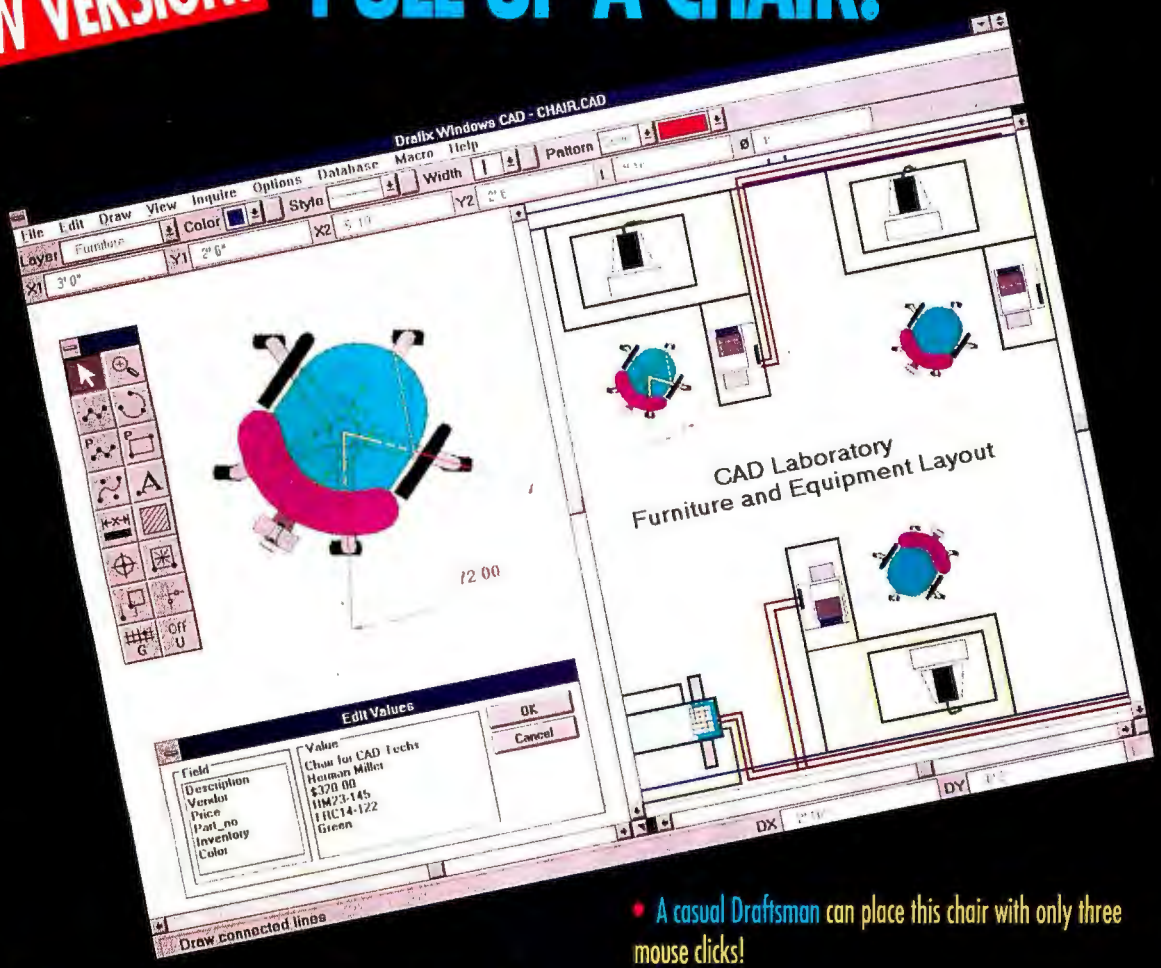
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maps, most people don't have a 24-bit display adapter. Although the Windows display device drivers will do the color reduction, the results are not acceptable to the developers of these packages. Each one implements its own RGB color-scaling method and hands the already-scaled DIB to the driver for display.

I evaluated the quality of each product's 256-color simulated 24-bit color display at 1024 by 768 pixels on the Mitsubishi 20-inch monitor. The unequivocal champ for clarity was WinRix, which managed to retain detail even in low-contrast images by not using a dither pattern. PhotoStyler came close to WinRix, but Image-in-Color Professional came in last with its obscuring dither pattern. I looked briefly at Micrografx Picture Publisher, and I consider it tied for second place with PhotoStyler. Image-in-Color Professional's display was definitely inferior.

The importance of this clarity was emphasized when I tried to do some detailed editing on a girl's head-shot picture, clearing the background away from her hair. With the Mitsubishi monitor and Image-in-Color Professional, and then PhotoStyler, I couldn't tell hair from background. With WinRix, I could clearly discern where her hair ended and the background began.

In all three products, frequently used functions, such as the paintbrush, are tools on a button bar. With PhotoStyler and WinRix, you can position each button bar anywhere in the application's window or hide it from view; WinRix also allows you to put the button bar outside the document window so that it doesn't obscure any part of the image.

PhotoStyler has two button bars, Paint and Select, with two columns each. WinRix has two alternating button bars: one with raster (paint) tools, and the other with object (draw) tools. Image-in-Color Professional has one fixed button bar to the left of the application window.

The painting tools in all three packages have controls to determine how and when to deposit "paint" on the picture—always, hue only, additive, transparency, flow rate, and so on. You can try out the effect in the scratchpad area in the tool dialog box. The only geometric tool PhotoStyler provides is "paint a straight line." With Image-in-Color Professional, you can draw (paint) lines, ellipses, rectangles, open and closed Bézier curves, and polygons. With WinRix, you have five object-draw tools: line, square and rectangular box, ellipse and circle, Bézier curves, and polygon. Since they are objects, you can individually edit them afterward (as in CorelDraw). When you save a WinRix image with objects, the objects are automatically saved in Windows Metafile (WMF) format.

Since text is supported through Windows, all the fonts you've installed in your copy of Windows are automatically available. An outline font generator, such as Adobe Type Manager, increases selection and quality of compatible typefaces.

PhotoStyler and Image-in-Color Professional incorporate text into the image as a bit map. WinRix text is in outline form when created and saved in the separate object layer. As with all WinRix objects, you can rasterize it into the bit map whenever you like. This ability is especially significant when you're using Adobe Type Manager, because if you leave the fonts as objects they will be printed at the full resolution of the printer (e.g., 300 dpi) instead of that of the screen (e.g., 72 dpi)—and, therefore, at the correct type size.

However, WinRix counters this advantage with the difficulty of selecting a suitable typeface (it doesn't provide a sample). PhotoStyler will convert any letter

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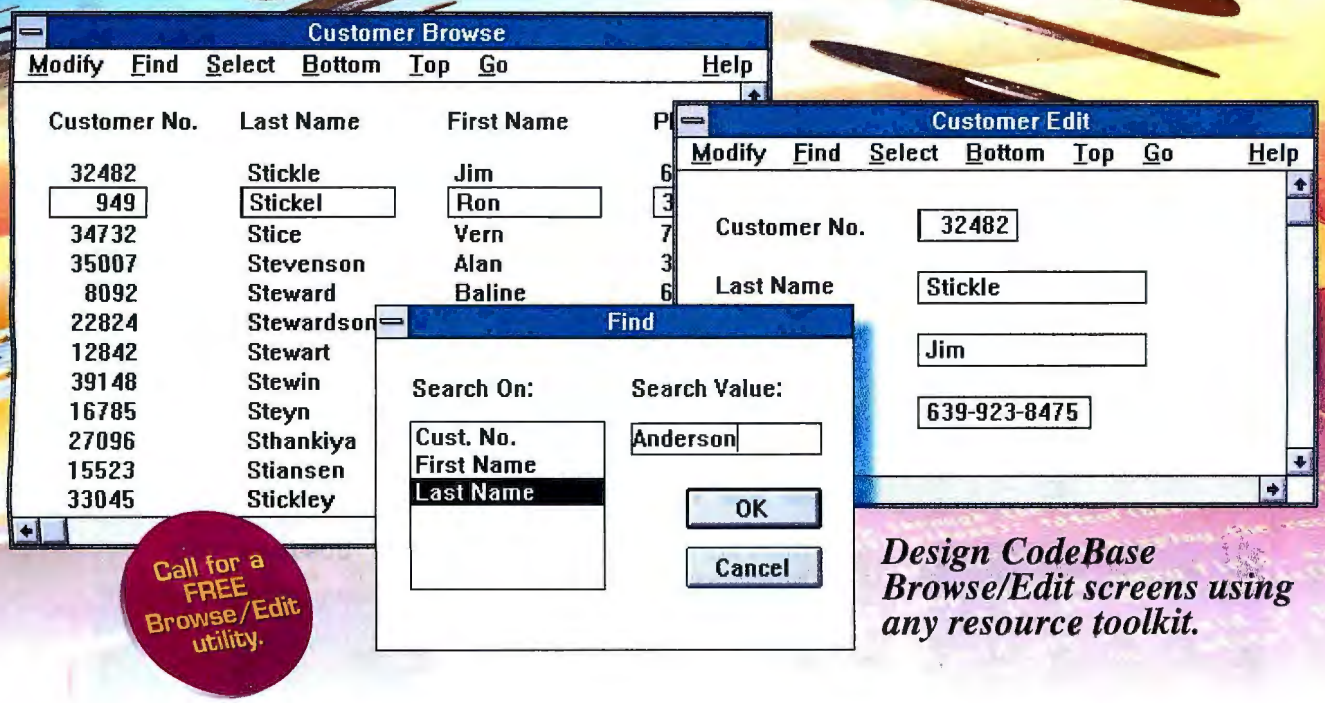


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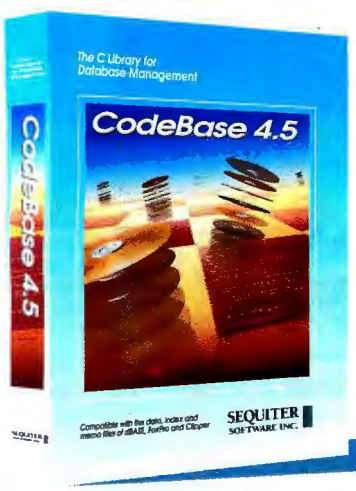
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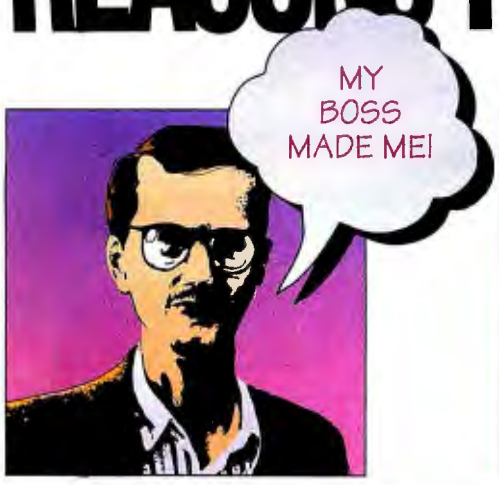
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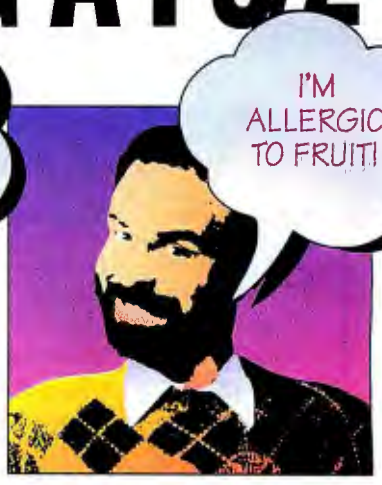
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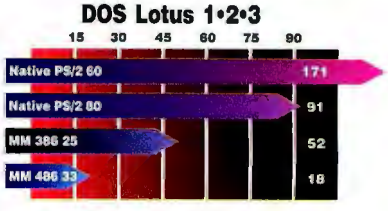
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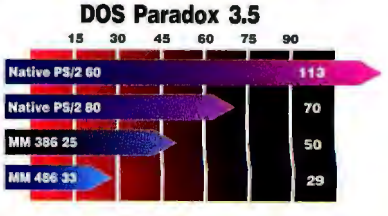
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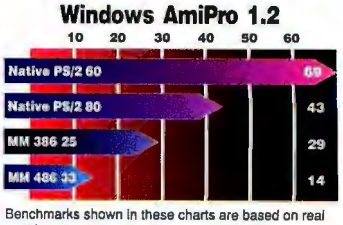
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Benchmarks shown in these charts are based on real world applications, taking into account CPU, memory, disk, and video performance. Smaller numbers indicate higher performance.

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you enter into the new typeface. With Image-in-Color Professional, you can move a slider through the entire alphabet. If you have more than 70 fonts in your system, trying to use the text tool in Image-in-Color Professional results in an "Unrecoverable Application Error" message. The people at Image-in are aware of this bug and hope to have it fixed in its next release.

PhotoStyler and Image-in-Color Professional provide the same tools for selecting portions of an image: not only the rubberband rectangle familiar to those who use Windows Paint, but a square, an ellipse, a circle, a single line of pixels, an irregular area (freehand and polygonal), and a magic wand. WinRix provides the ellipse, lasso (freehand closed figure), rectangle, and magic wand. Both WinRix and PhotoStyler put the selection tools on the button bar; Image-in-Color Professional has one selection tool—you double-click on it to bring up a dialog box with the various tools.

I found using the ellipse selection in WinRix less than satisfying, since all I could do was tug on the surrounding box's frame at its edit points. WinRix doesn't allow a drag from center: I wanted to center the subject's face in the elliptical selection area by placing the cursor on the center and working out from there. Only PhotoStyler lets you continue the rubberband past the edge of the window by automatically scrolling.

WinRix's magic wand selects a region based on similarity to the color at the cursor location. PhotoStyler also uses this principle for functions like "bucket" and gradient fills and the various image-processing functions. Using the magic wand in Image-in-Color Professional on larger images with even a small tolerance resulted in a "Too Many Data Points" message.

In PhotoStyler, you can save selections for use on other images with the Mask Import/Export function. Combined with the selection-inversion control, it makes sophisticated photocomposition available using any number of component images (unlike doing it photographically, where you are limited to only a few). Montages made with all three products are easy and take much less time than in the conventional darkroom.

The Soft Edge command modifies the selection border, giving it a feathered gradual fade over a range instead of a hard-edged transition. This is useful in making cut-and-paste images look more natural. PhotoStyler limits you to 5 pixels, Image-in-Color Professional to 32; WinRix has no limit.

All three products support changing the size of an image. Since they're specifically designed for scaling photographs, you will achieve better results using them, instead of a page-layout program or the printer driver, for this purpose.

Paintbrush, airbrush, and pencil tools are available for retouching. The clone tool is handy for getting rid of unwanted seams in the image; the bucket fill is useful for larger areas. The eyedropper tool allows an exact color match for painting.

All three products support most major file formats: Targa, PCX, GIF, TIFF, and BMP. WinRix also supports WMF (for objects) and RIX, while Image-in-Color Professional adds support for IMG (Ventura Publisher) and PNT (Macintosh paint).

None of these three products currently supports OLE (Object Linking and Embedding), the Microsoft Windows data-sharing method. In preparation for adding OLE in a future version, WinRix has scroll bars for its entire application window (and

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the usual scroll bars on a document window). For a comparison of the features for the three reviewed products, see the table.

Separating the Colors

All three products support color separation—the process of converting a color image into separate images of each of its component colors. In particular, separation into the four process colors—cyan, magenta, yellow, and black (the Pantone color system is CMYK)—prepares an image for reproduction on a four-color printing press.

However, each of these products produces very different separations. While they all follow the same basic concepts relating to optimizing separations, each uses different units to control the optimization, so it's impossible to set them up with identical control parameters. Once you have separated an image, you can send the files to an imagesetter service bureau, which will print them to film negatives to make plates for offset printing.

QuarkXPress on the Mac lets you import separation files and place them on a page layout that can then be sent to the imagesetter. When there are multiple images on a page, you'll achieve better results by going this route than by letting an imagesetter separate the entire page. Aldus includes a catalog of imaging service bureaus (also known as prepress houses) with PhotoStyler.

Strengths and Weaknesses

WinRix's object capabilities, along with its display scaling, are its strongest points. To accompany this object capability, WinRix comes with a nice selection of object clip art in WMF format. Since they are objects, you can stretch them to suit and combine them with bit-map images. WinRix also comes with ScanRix, a handy Windows screen grabber.

Of all the tools I've used to convert 24-bit images to 8-bit, PhotoStyler produces the best results. While WinRix is as good as PhotoStyler within a narrow range of colors, such as in a low-contrast, tightly cropped head shot, it goes astray when presented with a highlight (yet it has no problem displaying the image in simulated 24-bit color). Image-in-Color Professional does an unacceptable job of converting 24-bit images, showing grossly wrong colors throughout the image.

Help!

PhotoStyler's on-line help is extensive, with the index providing a good quick-start overview. The help function, however, is no substitute for reading relevant portions of the user's manual. For example, I found it impossible to add text to the image until I looked up the procedure. The documentation for spatial effects shows how to make them useful by combining them with image functions.

WinRix has context-sensitive help. Unfortunately, that's all it has. You can't use the help function to browse around for interesting, potentially useful features. Once you wade into a feature, though, the help function will tell you how to operate it.

Image-in-Color Professional's help function mostly consists of nonexplanatory command descriptions. You'll need to have the manual handy for looking things up when using this product.

Technical Support

Aldus has an interactive voice system for technical support that offers prerecorded answers for frequently asked questions. But none of them relates to PhotoStyler, so you must speak to a representative—which

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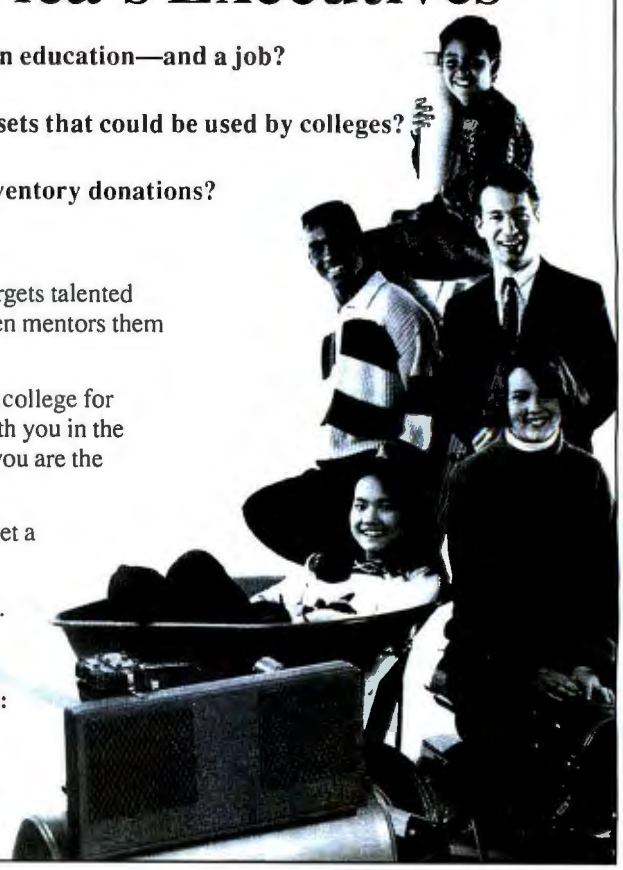
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usually means a 20-minute wait. Aldus's technical-support folks are friendly, knowledgeable (even on obscure topics like color separations), and full of helpful hints. When I wanted to change the color, but retain the shading, of the shirt a subject was wearing in an image, they walked me through the use of fill with hue only.

WinRix technical-support calls always go right through to a friendly representative who knows the operation of the product. When necessary (e.g., for obscure points or possible bugs), your call is referred to one of the developers.

Image-in technical-support calls usually go right through to a representative. When I called looking for advice on using Image-in-Color Professional to do color separations, I received a clear explanation of what each of the parameters did and was advised that I should use the defaults because they were industry standards and correct for most presses, as established by AgFa Compugraphic.

When to Reach for Each

At $795, PhotoStyler is a powerful tool for creating image magic on the desktop. For only $495, WinRix, too, has its uses, particularly when adding text to an image or painting detail areas on a 256-color display system. Image-in-Color Professional, at $795, has some interesting color prepress features. But (depending on your page-layout software, if any), you may get better results if you hand the prepress operator a color TIFF file than if you try to do the separations yourself with any of these products. It certainly is easier, anyway. While all the imagesetter service bureaus have at least one Mac, they don't necessarily have the software to turn a separated TIFF file into a page for printing. But they will have the software to separate a TIFF file.

In the competition to bring the functionality of color image editing to the desktop, PhotoStyler is the front-runner. While image-editing software is not really new to the PC, these first-generation Windows products bring image-editing capabilities to a much wider audience, because they reduce the need for an expensive 24-bit color display adapter. You no longer need to go to a Mac to do color imaging. ■

Dana Hudes is a freelance software engineer, writer, and photographer. You can reach him as "dhudes" on BIX, where he moderates the photo conference, or at dhudes@mcimail.com on the Internet.

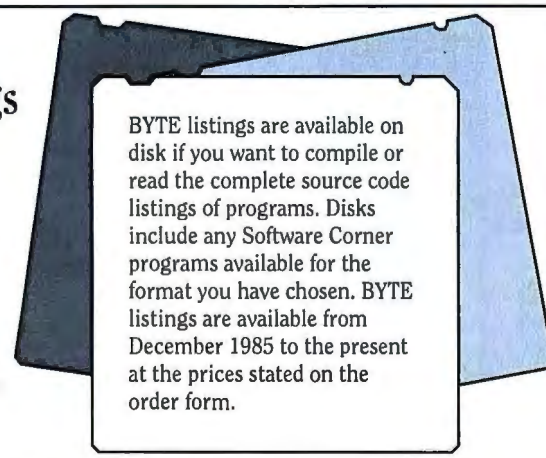
COMPANY INFORMATION

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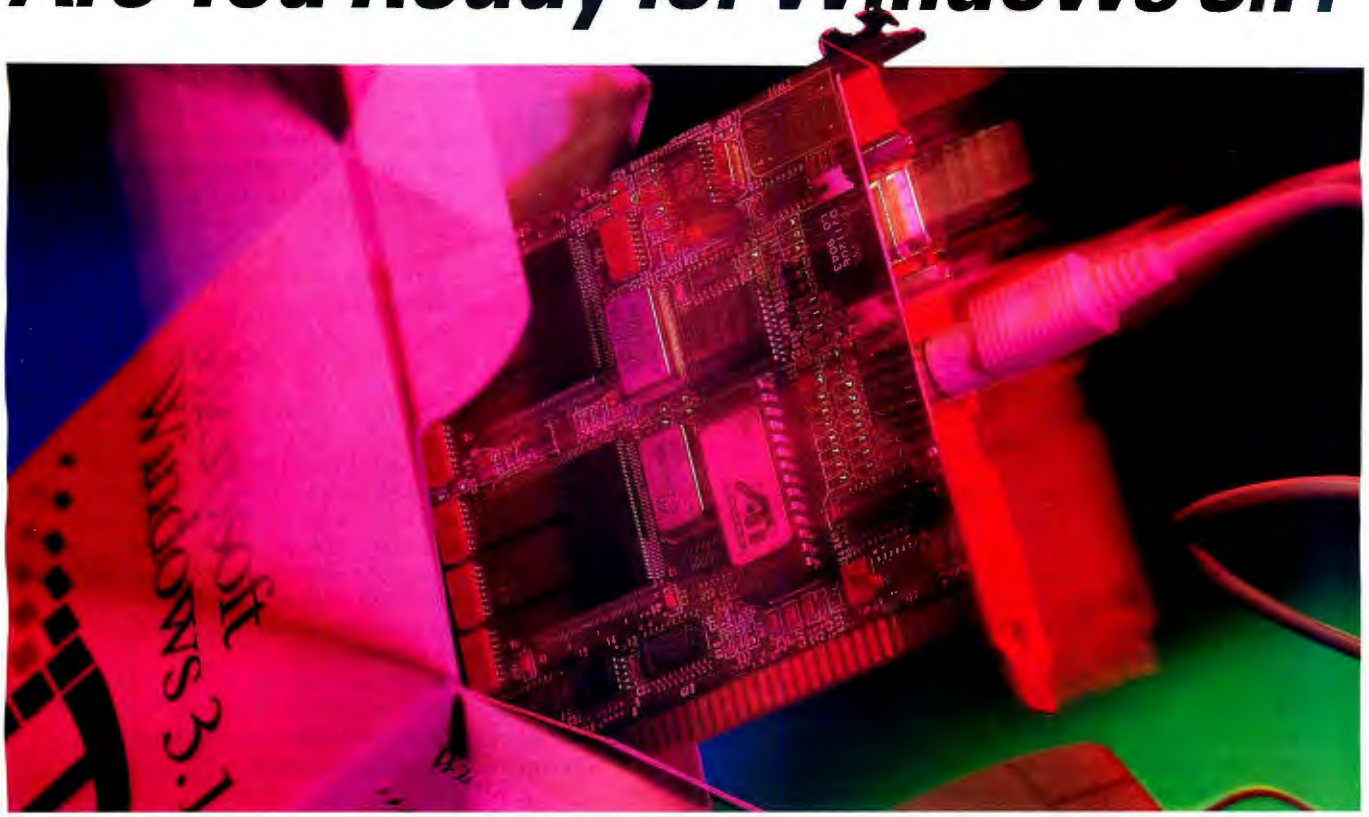
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ASK DR. WINDOWS



STAN WSZOLA

Sluggish Windows

Dear Dr. Windows,

I work with Windows 3.0, running Word for Windows, Excel, and so on. I have a 16-MHz 386SX with 8 MB of RAM, a 387SX coprocessor, a 100-MB hard drive, and a VGA card. I use MS-DOS 5.0. I want Windows to be a little speedier. What can I do? Must I use SMARTDRV? With what parameters? Must I use a RAM disk? What size? Should I use a swap file that's permanent or temporary? Must I run Windows in enhanced or standard mode?

Manuel Goncalves
Lisbon, Portugal

Using SMARTDRV or another Windows-compatible disk-cache program can dramatically improve Windows' performance. Since you have 8 MB of RAM, you can easily set aside 2 MB and use it as a disk cache.

If you want to invest in performance hardware, buy a caching drive controller and a fast hard drive. The hardware cache on the controller card, combined with the faster performance of a speedy hard drive, will shave a considerable amount of time off each disk access.

A RAM disk may not give you much of a performance boost. It's usually better to rely on a smart disk-cache program and let it determine which disk sectors should be stored in RAM, rather than copying a large number of files to a RAM disk and using only some of the files. Much of the RAM disk would just be cluttered with useless files that would soak up your RAM.

There's a slight advantage in setting up a swap-file area on your hard disk. You use the SWAPFILE.EXE program to set aside a certain amount of the hard disk for exclusive use by Windows. This provides faster access than a temporary file area would. You also avoid the time delay in creating a temporary swap file each time you load Windows and deleting it each time you exit Windows.

You can try several tricks to improve your video card's performance. If you are using 256-color mode, switch down to 16-color mode, or even monochrome mode. Use the latest version of the Windows driver for your video card. If the current driver is more than a year old, chances are that the manufacturer has written a faster one to improve Windows performance. Make sure your video card is running in 16-bit mode. Check your card's documentation and the switches or jumpers on the board. Also, make sure that no other 8-bit devices on the PC's bus are forcing your video card into 8-bit mode. For a real speed boost, consider upgrading your video card.

Upgrade to Windows 3.1. Microsoft has fixed some of the performance problems that people have found inversion 3.0.—Stan Wszola

Windows in a Small Space

Dear Dr. Windows,

According to Microsoft, Windows should run in standard mode on a 386SX with 1 MB of memory, VGA with 256 KB, and DOS 5.0. Well, after three installations and much messing around with the AUTOEXEC.BAT and CONFIG.SYS files, as well as enabling/disabling BIOS shadowing, I still can't get the thing to fire up in standard mode. Can you suggest a remedy? We just bought PageMaker 4.0 for Windows, and if I don't get it to work soon, my boss will probably throttle me.

William Byrd
North Little Rock, AR

You're simply going to have to add more memory. PageMaker needs 2 MB, and if you're going to run ATM (Adobe Type Manager), which is a very good idea, you'll want at least 4 MB. Plan on using 4 MB with 1 MB set aside as a disk cache. Personally, I can't imagine running Windows and PageMaker 4.0 without 8 MB of RAM, with 2 MB for a disk cache (preferably something better than SMARTDRV) and a 256-KB ATM font cache.

If you're really serious about running Windows, I recommend getting a 386DX running at 25 MHz or higher. Make sure it has 8 MB of RAM, and cache the beejabbers out of everything.—Howard Eglowstein

Windows Modes

Dear Dr. Windows,

I've heard people complaining on BIX that DOS 5.0 will not let you run Windows in standard mode—only in enhanced or real modes. Some people point the finger of blame at EMM386.SYS, but I don't know if this is true.

J. Bryan Kramer
Newberry, FL

It is possible to run Windows in standard mode with an expanded memory manager installed. It just depends on which EMS manager you are using. Quarterdeck's QEMM will let you run in standard mode; DOS 5.0's EMM386 and Qualitas's 386Max will not.

If you want to temporarily run in standard mode, just edit your CONFIG.SYS file and insert a REM in the line for your EMS driver. Then reboot and run Windows with the command WIN /S.—Stan Wszola

Where's DOS?

Dear Dr. Windows,

My 3-year-old deleted the DOS-prompt icon from my main program group, and I can't figure out how to get the darn thing back. What program is responsible for the DOS prompt? Normally, when you delete a program from a group, the program is still on the hard drive. But I can't find a program for the DOS prompt. Do I need to reinstall Windows just to get it back? I can't find anything on the installation disks that looks like it would help, so I'm assuming there's a switch someplace. I can't find any documentation for it, though.

Tom Jeffries
Oakland, CA

continued

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ASK DR. WINDOWS

Windows is funny in that running a DOS session is more like running an application than like going to the operating system. To restore your DOS-prompt icon, run Windows and open your main program group. Then click on the File item in the Program Manager's menu bar; this will display the options. Click on New; this will display the New Program Object window. Click on Program Item and OK. Next, you'll see the Program Item Properties window. On the Description line, type `DOS Prompt`*, and on the Command line, type in the location for COMMAND .COM (e.g., C:\DOS\COMMAND.COM). What you're doing is making a new DOS Program Manager icon.*

An alternative is to use the PIF (program information file) Editor to create a custom PIF for DOS. This method lets you enter options such as reserving more environment space for DOS. Either method works.

For the future, I suggest you copy the DOS prompt into another program group, in case your young Windows user experiments with using the delete command again.
—Stan Wszola

TIPS FROM THE DOCTOR

Beyond COM2

Many users have reported trouble using Windows 3.0 with COM ports 3 and 4. Windows 3.0 recognizes all four COM ports, and you can configure the setting for each port via the Control Panel. But Windows 3.0 refuses to share a hardware IRQ (interrupt request), and that's partly what's causing the problems.

You can have up to four serial ports, each with its own I/O address, but the four ports share two interrupts:

Port	Address	IRQ
COM1	3F8h	4
COM2	2F8h	3
COM3	3E8h	4
COM4	2E8h	3

Problems arise, for example, if you are using a serial mouse on COM1 and you have an internal modem on COM3. This setup won't work because the mouse and modem are in contention for the interrupt that is shared between COM1 and COM3. This problem also occurs if you are using a serial mouse on COM2 and want to use an internal modem on COM4.

COM3 and COM4 may not work reliably under Windows 3.0 (in standard and real modes) unless both COM1 and COM2 are first activated. So, in general, don't use a serial port with one of the higher numbers (2, 3, or 4) unless all lower-number ports are first activated or in use.

If you are running in 386 enhanced mode, you should also check the default setting in the 386ENH section of the SYSTEM.INI file for proper functioning of the ports. You should add these four lines to that section:

```
COM1BASE=3F8h
COM2BASE=2F8h
COM3BASE=3E8h
COM4BASE=2E8h
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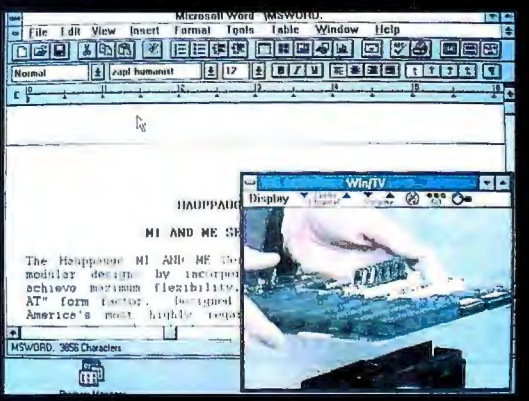
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ASK DR. WINDOWS

The procedure for modifying the SYSTEM.INI file for Windows 3.0 is described in detail in SYSINI2.TXT under the 386ENH section.

Windows 3.1 avoids this problem because each port can be assigned a unique IRQ. You can configure each port through the Advanced Settings section of the Ports dialog box in the Control Panel.

Icon Space

Windows assigns each icon a standard amount of space on the desktop. Sometimes you want to give an icon a long, descriptive label, but when you've got a lot of icons on the screen, the labels overlap. The remedy? Adjust the spacing between icons.

Here's how: Go into the Control Panel and click on the Desktop icon. Move to the Icon Spacing text box and click on the up and down arrows, or enter a number in the box, to increase or decrease the icon spacing (the numbers represent the spacing in pixels). The new spacing will take effect the next time you rearrange your icons.

You can also arrange your icons according to an invisible grid. The icons will snap into place along the invisible lines of the grid. Again, click on the Desktop icon and choose the Granularity text box. Click on the up or down arrows to change the spacing of the grid. The range is 0 to 49. A 0 will turn off the grid; a 1 will create a grid with intersections every 8 pixels; a 2 will place intersections every 16 pixels; and so on.

Hazards to Your Health

If you are running a DOS session under Windows, there are some DOS commands or programs that you shouldn't run. Even when Windows is suspended during a DOS session, some DOS commands or programs can disrupt or damage the Windows files that are still open.

It's acceptable to use the CHKDSK command, but not CHKDSK/F. The /F or "fix" variant of the command looks for cross-linked files and can confuse open Windows application files for corrupted files.

Never optimize your hard disk while running Windows. Programs like Vopt or Norton's Speed Disk can rearrange the location of clusters and files, leaving Windows without a clue to where some essential information is located.

Some DOS commands, such as APPEND, ASSIGN, JOIN and SUBST, may confuse Windows by changing the drive designations.

Switching Tasks

One of the handiest Windows keyboard shortcut commands is Control-Escape. This command lets you call the Task List and switch to another application. For example, you can be running a non-Windows program, such as a favorite word processor, and, by pressing Control-Escape, switch to the Task List and select the Program Manager. From the Program Manager, you can run any other Windows application, and then you can press Control-Escape to switch back to your word processor. ■

Dr. Windows, also known as Stan Wszola, is assisted in his diagnoses by Howard Eglowstein, and Ray Côté, testing editors for the BYTE Lab. You can reach them on BIX as "stan," "heglowstein," and "rgacote," respectively.

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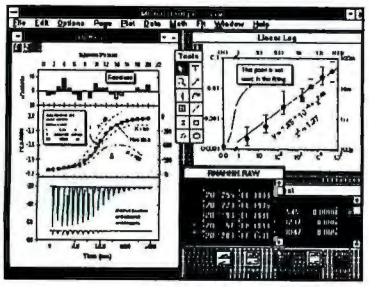
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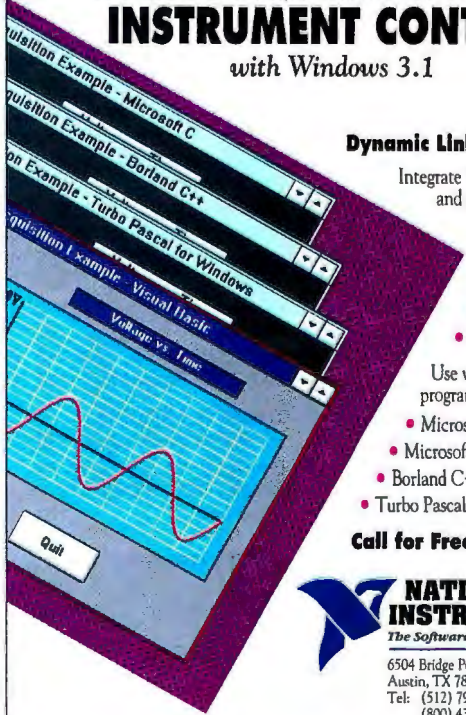
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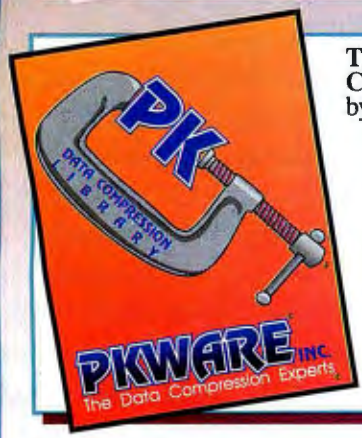
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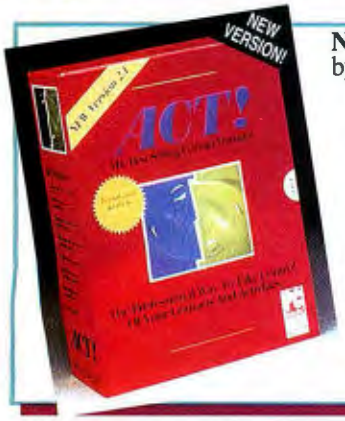


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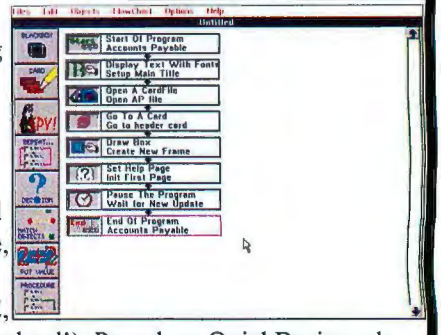
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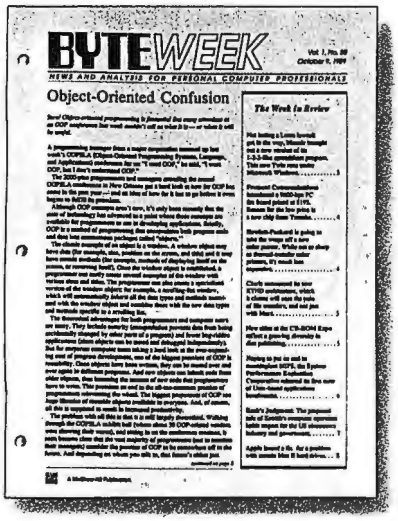
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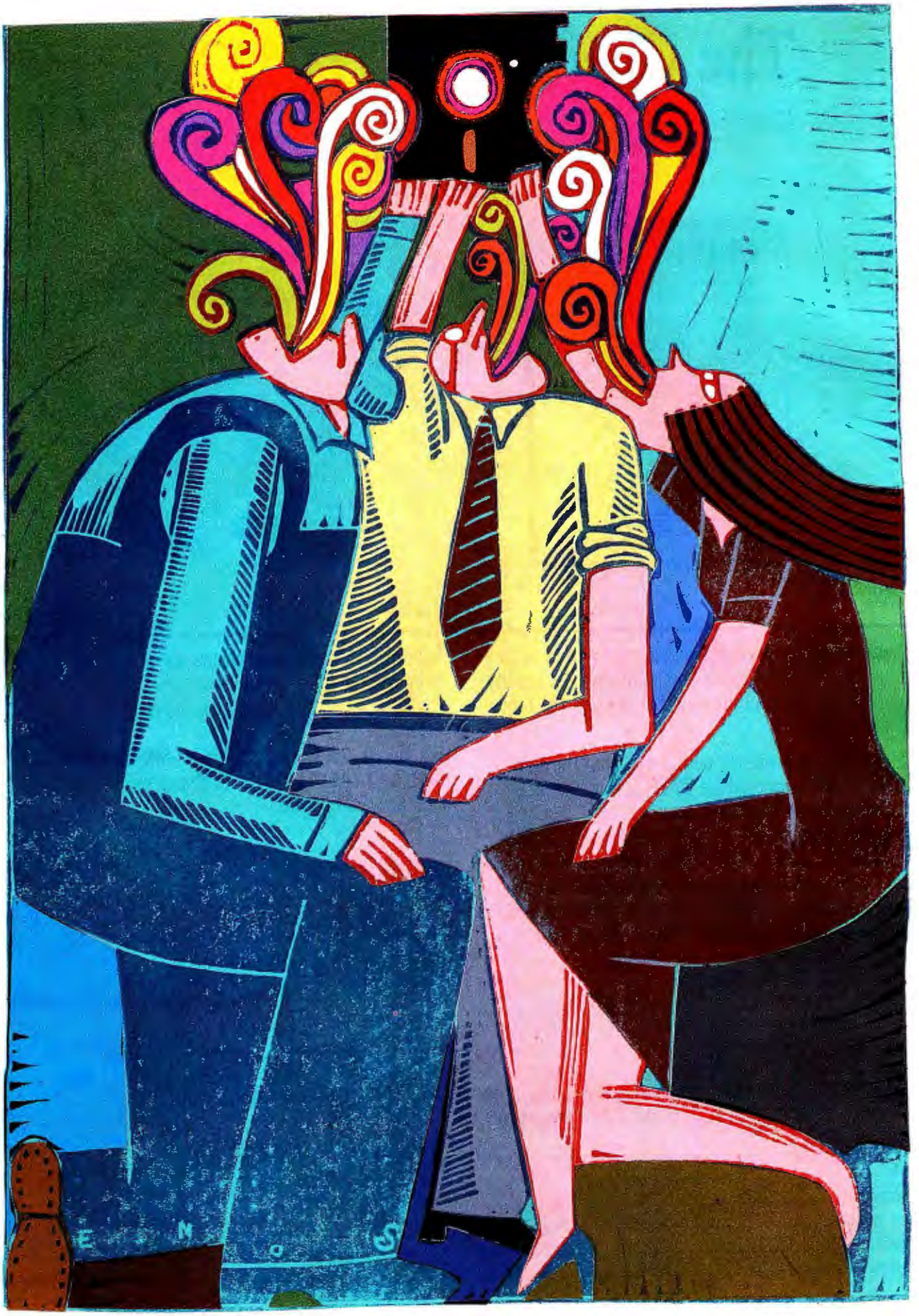


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MAKING KNOWLEDGE PAY

To compete in today's fast-moving business environment, organizations must create a culture of shared understanding

CHRISTOPHER LOCKE

It's common to hear someone say that technology is changing the way people do business. On the surface, this seems like a self-evident truth. On closer scrutiny, however, you discover that unexamined belief in this hackneyed sentiment gives rise to innumerable high-tech tools that force people to work in unnaturally constrained ways according to old (and possibly obsolete) assumptions. Inverting the cliché yields a closer approximation of the truth: The way people do business is beginning to elicit radically new technological responses.

There is always a reciprocal relationship between how business is pursued and the technological tools used to pursue it, and this reciprocity can lead to fruitless chicken-and-egg arguments about what influenced what first. Practically speaking, however, most organizations design and implement software systems based on obsolete principles stemming from the bygone era of mass production. This article examines how technology is finally responding to how you do business today.

The Way We Were

In the days of large, stable, and chiefly domestic markets, there was little pressure to innovate. A product might remain essentially unchanged for years or even decades. Because companies churned out enormous quantities of these products, the processes that controlled their manufacture could be "rationalized" and eventually automated. A significant economy of scale resulted: The more volume increased, the more unit costs dropped. Because knowledge of the design and control of these repetitive assembly-line procedures tended to be concentrated at the top of organizations, the time that was needed to train workers was radically reduced. In the typical mass-production scenario, workers could be taught in minutes or hours to perform tasks that they might repeat for a working lifetime.

The downside of this cost-benefit is often called *deskilling*. In mass production, fewer people understood what they were doing. The worker who inserts the bolt, thought Henry Ford, should not be the same worker who tightens the nut. During the period sometimes known as the second industrial revolution, pride in craftsmanship and deep learning through apprenticeship quickly gave way to an automatism in the performance of work. A spirit of fatalistic resignation and often alienation came to characterize the American workforce. Although workers resented being treated like appendages of the new machines, their companies were thriving on the rising output. As computer-controlled automation became available, companies began to replace workers with increasingly "intelligent" systems.

By the early 1970s, the dawn of truly global competition conspired to break this rising spiral of automation, higher output, and lower costs. Asian and European companies started to capture significant portions of markets where American companies had previously enjoyed unchallenged hegemony (e.g., consumer electronics, automobiles, chips, and computers). Today, markets are irreversibly fragmented, product diversity is far greater, production runs are correspondingly shorter, and economies of scale are getting very hard to find. Mass production is dead, but many companies have been slow to appreciate this as a permanent change. In fact, the change represents a seismic paradigm

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shift, and the lag in corporate perception has cost billions of dollars in lost markets and widespread unemployment.

Organizations and Software

What does this whirlwind historical tour have to do with the software that you use to manage your business? Everything. "Intelligent machines" are great at controlling relatively stable mass-production operations, but they require quotation marks because they are incapable of innovation. This is bad news for certain wishful thinkers. Innovation is the key to global competitiveness, and innovation requires learning. The fatal catch is that only human beings are capable of learning in any meaningful sense. Only through the firsthand experience, deep process insight, and rapid adaptability of their people can organizations meet the fundamentally changed expectations of world markets. You don't need more questionably intelligent automation; you need tools that will support, not attempt to supplant, human understanding.

The central-mainframe-and-master-database business model has long assumed that accurate and adequate knowledge resides only at the top of organizations and that only this privileged knowledge can command and control a hierarchy of business units and their constituents. That assumption has been seriously challenged over the past decade with the swift proliferation of personal computers, workstations, and LANs. Still, the mother-of-all-databases mentality lives on in the design of many software tools, and a lot of managers continue to believe that only by carefully controlling the contents of database fields can they define, circumscribe, and confer legitimacy on a subject. But where fixed-field items (e.g., employee number, pay rate, and mother's maiden name) are used to delimit a person's identity and worth, something irreplaceable is being lost.

Where's the Knowledge?

The problem is that people in business are no longer sure of what it is they need to know. The challenge is not to increase efficiency, as in the heyday of mass production, but to deepen vision. A number of companies that automated to the point of "lights-out" operation have since had their lights turned out by Chapter 11 proceedings—not because they weren't productive, but because they were offering the wrong products. So, what is the right stuff? A bigger question is, Who knows?

In the mid-1980s, many hoped that AI would revive the recurrent management dream (or nightmare) of central control over increasingly complex operations. By capturing essential knowledge and automating the rules by which it was to be applied, AI promised to replicate (or replace) the human intelligence previously required to perform high-level work. But the world had another idea.

To be effective, so-called "expert systems" largely require a stable world (a *well-bounded domain* is the preferred jargon), one that has already made up its mind, so to speak. Although such stability may have characterized the era of mass production, it has long since been swept aside in most environments by an unrelenting dynamism. Had AI been available to Henry Ford, it might have worked miracles. Today, it simply doesn't work.

Knowledge is not fixed, nor is it the exclusive province of an organizational elite. Despite years of deskilling automation, intimate knowledge still resides with people close to critical production processes—regardless of whether their collars are blue or white or whether they produce washing machines or financial reports. Genuine knowledge has two irreducible aspects: It is seldom structured in the form of fixed fields or dependable rules, and it's social (i.e., it is distributed as shared understanding among human groups that often have little respect for artificial organizational boundaries).

The articles in this State of the Art section focus on new kinds of tools for articulating, organizing, and sharing such bona fide knowledge. For the most part, they deal with unstructured information: language. Although the outline of a book is definitely a structure (and a useful one), it doesn't constrain the content that can be communicated in the same way that a database's record structure limits the content of prespecified fields.

A note of explanation is in order here. It's easy to equate language solely with text, and, indeed, many of the tools described here deal with textual information. However, many can also accommodate graphics, sound, and video—the full range of multimedia communication. What distinguishes *language*, in the sense the word is used here, is not mode but modus. Language is narrative; it enables the telling of stories. As John Seely Brown of Xerox Palo Alto Research Center has pointed out, such stories are the real expert systems that enable organizations to function effectively (see "Research That Reinvents the Corporation" in the bibliography).

Tools such as databases, spreadsheets, and expert systems may be useful for massaging data or automating routine procedures, but they are poor vehicles for telling stories. The data these tools contain is not readable in the sense that a story is readable. How much plot development can you get out of a field descriptor, a cell formula, or an if/then rule? Also, these tools impose so rigid a context that there is no room for readers to interpret, amplify, reshape, and retell their contents—the means by which stories not only are propagated but often evolve into something unsuspected at their inception. This nearly genetic potential for recombinant mutation through social transmission points to the enormous value of work-related stories: They express a collective imagination that is often far greater than the sum of the imaginations of those retelling the stories.

This living knowledge emerges as people share their perspectives and defuse their collective prejudices, blind spots, and unfounded assumptions. This collaborative exploration cannot be automated or controlled by the old mechanisms of organizational management (i.e., the hierarchy, the chain of command, the delivery of cut-and-dried marching orders).

Although the two are frequently confused, knowledge differs from data in that it evolves along a critical path from story to culture to organization to technology. Too many companies have this natural selection process backwards, and they are drowning in a sea of high technology without insight or content, often producing products and services of abominable quality. This is precisely why you hear so much about concepts such as workforce empowerment, employee involvement, self-

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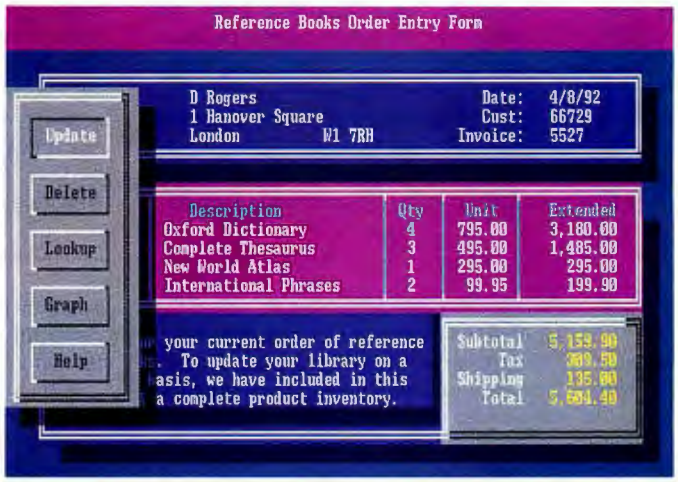
Knowledge, so crucial to innovation, must be distributed throughout organizations, not concentrated in their executive suites. Companies that want to survive in the new competitive environment need to listen closely to the stories their people tell in the course of their work and to find ways to broaden that discourse. This State of the Art section offers suggestions for advancing such an agenda.

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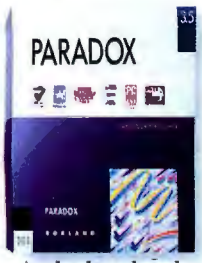
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Collaboration '92

Collaboration '92, a new conference dealing with many of the issues raised in this article, will be held June 1–3 in San Francisco, California. I will be present as chair of the conference, and Haviland Wright and Louis R. Reynolds, whose articles appear in this State of the Art section, will also be there.

Subtitled "Learning to Team, Teaming to Learn," the conference will feature keynote talks by Michael Schrage, author of *Shared Minds: The New Technologies of Collaboration* (Random House, 1990), and Charles Garfield, author of *Second to None: How Our Smartest Companies Put People First* (Business One Irwin, 1991). Other speakers include John Seely Brown, director of the Xerox Palo Alto Research Center; Etienne Wenger, research scientist at the Institute for Research on Learning; and Terry Winograd, professor of computer science at Stanford University.

These and many other speakers from consulting organizations, Fortune 100 companies, and the national business media will address the factors influencing the paradigm shift that has taken place in corporate perspectives and priorities in recent years. They will put current organizational change into historical context by examining why previous corporate structures and styles of management are inadequate to meet present demands, and they will describe the advantages accruing to organizations based on human initiative, local autonomy, and collaborative learning. These difficult but necessary cultural changes occurring in business organizations can be either nurtured or obstructed, depending on the computer and communications systems adopted. This intersection of corporate culture and information technology constitutes a primary theme of the conference.

Collaboration '92 is being organized by the Graphic Communications Association (Alexandria, VA).

directed work teams, participatory management, and concurrent engineering. Organizations critically need knowledge they can no longer supply from the top down.

Ironically, relinquishing power to the people is also the major factor fueling a new breed of knowledge-based high-performance business organizations. Such organizations do exist, and they will be highlighted at a conference that explores how technology can help organizations come to grips with the new realities of doing business (see the text box "Collaboration '92" above).

If the idea of corporate story telling still seems farfetched, consider some of the channels through which you practice the art every day: when you use the telephone or when you interact with people you meet at the copier or the fax machine. And these are only the older trade routes in the story traffic. The social concept of networking is now almost inseparable in some quarters from the physical networks that support it: LANs, internets, and electronic conferencing systems—even sneakernets play a significant role in networking. Marriages are being announced every day between computers, fax machines, modems, cellular phones, phone companies, cable networks, and electronic information providers. The distinction between hard copy and soft copy is rapidly blurring.

Knowledge Sharing

I recently installed a fax modem in my computer that enables me to do some interesting things. I can capture a page from a book using my copier and then fax the copy to myself. Using optical character recognition technology, I can convert the fax image to machine-readable text. Voilà, I've got a fairly intelligent "distributed" scanner.

Taking advantage of the modem's Send facilities, I can dial up the Well (an on-line conferencing system in California) using Sprint's or CompuServe's carrier services and transfer the newly captured file from my PC to my remote Unix account. I can then post the file in a conference that I host there, where it will be read—and downloaded—by people logging in from around the globe.

I can also send the file via E-mail to my editor at BYTE with the comment, "Hey, what do you think about including this material in the article we talked about?" If the piece fits, the editor can download the mail file to BYTE's composition software, and you might read it on these pages as hard copy. But, in between, it has been as "soft" as it gets. On the other hand, my editor may send return E-mail saying that the topic was covered thoroughly three years ago.

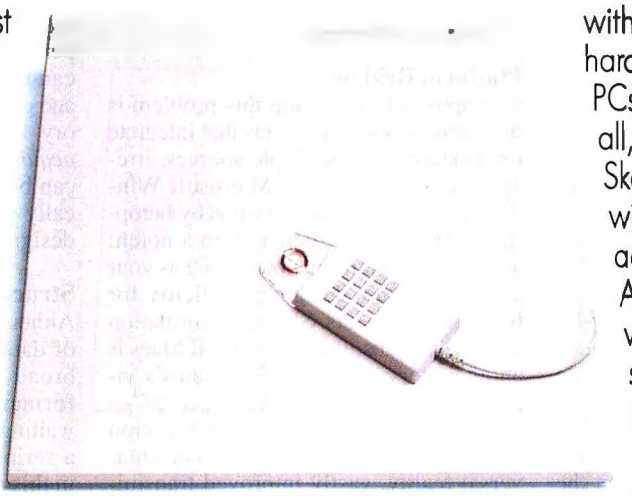
In the meantime, on the Well, the original information has probably generated responses and caused an exchange of ideas and information on related topics among other members of the conference. Conversely, the information might be reposted in a BIX discussion. These opinions, annotations, and pointers to related material, whether in print or on-line, constitute a powerful virtual conversation among people who may never meet face-to-face.

This form of networked conversation is the electronic analogue of the proverbial water-cooler discussion in which serious organizational matters are often communicated and sometimes even resolved. Part of it is trivial banter, but another part of it is significant information that individuals might never be aware of without this exposure to a larger community of loosely associated potential collaborators. The collective network is like a "Big Mind" in which our personal knowledge and intelligence is a single node. And big thoughts are brewing there—a kind of massive parallelism with a human face. This point is critical, because without the social banter and human connections, none of the rest is possible. People don't interact for very long in fixed-field datapoints.

What happens to all the information that you collect—the faxes printed on sheets of greasy low-resolution paper, the disks crammed full of on-line database downloads, and the overflowing E-mail boxes? Usually it winds up in the directory structures on your personal computer or workstation. These structures represent attempts (usually fairly primitive) to create personal classification systems—think of the Dewey decimal system on a small scale (see "The Dark Side of DIP" in the bibliography). But because nobody has all the answers, it's becoming increasingly necessary to share this "personal" information

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with one or more collaborative work teams, whose members may be dispersed throughout a large corporation or belong to entirely different organizations dispersed over several continents (see *Enterprise Networking: Working Together Apart* in the bibliography).

Community Tools

How do you share your personal information? Initial responses to this problem include the construction of shared network-directory structures, which attempt (though they often fail) to reflect a consensus about the categories of information they are designed to organize. A more systematic and comprehensive response is the adoption of concept-oriented information retrieval systems (see "Search and Retrieval" on page 271).

One such system is Topic from Verity. Topic enables the construction of *semantic networks*, complex webs of ideas and their interrelationships. You can navigate the concepts along relational linkages until you find something that seems relevant and then ask for all the documents the system has on that subject. Because these conceptual maps are independent of the base data (usually free-text information having no consistent format), you can think of this approach as a kind of virtual hypertext.

It's possible to empty a Topic textbase of its documentary contents; reindex a completely new, but substantively related, set of documents using the same topic nodes and links; and retain the fundamental relationships among the base information objects. This method differs significantly from the explicit embedding of hypertext links in documents.

Explicit hypertext links are not an inferior approach by any means. Often, significant relationships cannot be deduced from conceptual proximity alone. A wide range of document types (e.g., manuals, E-mail, legal contracts, and on-line database downloads) can all be intimately related to a single project. Relying on the co-occurrence of key words to link heterogeneous objects might not always work. Hypertext systems enable such objects to be bound together at their point of intersection (e.g., a reference to a contract in a letter).

Another form (what I call *structural hypertext*) takes advantage of the logical organization of many documents into sections, chapters, paragraphs, figures, and tables. With this method, if the table of contents is well designed, people can browse at a high level and then drop down into the relevant details. DynaText from Electronic Book Technologies (see "Electronic Books" on page 263) provides for both types of hypertext, as well as Boolean queries against fully indexed document collections.

Early on, many systems that deal with unstructured information run up against a formidable barrier: proprietary data formats. For instance, all commercial word processing programs implement some form of markup strategy by which a writer indicates centered headings, bold or italic text, indented paragraphs, enumerated lists, and so on. The way this markup is encoded differs for almost every product on the market. The result is that one brand of word processing software cannot read files created by another. One way around this is to work in a text editor that uses only the ASCII character set. The original Unix facilities (e.g., `vi`, `nroff`, and `troff`) took this approach.

The format/markup problem also pertains to graphics, database, spreadsheet, and just about any other kind of file you can think of. Providing needed information to workgroups when they require it has become a major challenge in most organizations. This is especially true in companies attempting to break down the organizational walls and functional "chimneys" that separate people who critically need the benefit of each other's experience.

Platform Bridges

One approach to solving this problem is the use of software products that integrate information from multiple sources, irrespective of the vendor. Microsoft Windows and Macs accomplish this by bumping the proprietary demand up a notch: You can share information as long as your applications are designed explicitly for these environments. Sharing information between Microsoft Windows and Macs is another story. Although Bill Gates's vision of "information at your fingertips"—or still farther out, John Scully's notion of a "knowledge navigator"—is not a universal reality, vastly improved transmigration of data is certainly looming on the horizon. Carousel, a new document-publishing technology from Adobe Systems, is explicitly designed to migrate documents between disparate platforms while retaining much of the original look and format (see "The New Age of Documents" on page 257).

In the manufacturing arena, CIMLINC has developed an environment called Linkage, which allows information from widely distributed network sources and a broad array of proprietary software packages to be brought together in one form on a Unix workstation or X Window System terminal screen. In addition to textual information of all kinds, these forms can present live vector graphics, raster images, information returned from SQL (Structured Query Language) queries against multiple databases, and near-real-time video images captured with a fast frame grabber. These forms can be scripted by people associated with the production processes, even if they have little or no programming knowledge.

By assembling the information in one place, these screens can convey the core information required for self-directed work teams to execute—and continuously improve on—extremely complex manufacturing tasks. Most important, perhaps, this environment is a two-way street: It not only delivers design and manufacturing engineering specifications to the shop floor, but it also elicits feedback on potential problems and process improvements from people intimately familiar with manufacturing operations.

This kind of cross-functional collaboration is at the heart of what in some circles is called *concurrent engineering*—simultaneously designing products and their associated manufacturing processes with early input from all groups that have relevant knowledge, regardless of where they are located in the organization, either physically or hierarchically. With experienced people in the loop, a company can begin to learn through such systems and greatly expand its organizational memory. In this light, the so-called *knowledge acquisition bottleneck* (AI's great nemesis) can be seen as the kind of problem typically generated by fundamentally flawed design principles.

Structuring Information

Although Linkage relies on a wide variety of data-type translators to integrate this broad bandwidth of manufacturing information, a more general solution is waiting in the wings and is about to make a serious debut in corporate computing in this country. This solution goes by the daunting designation of Standard Generalized Markup Language. SGML is a well-established ISO standard and has been mandated by the Department of Defense as the markup methodology to be used in all aspects of the far-reaching Computer-aided Acquisitions and Logistics Support program. SGML has also been accepted by the Air Transport Association (which represents airframe manufacturers) and a growing body of supporters in many industries, government agencies, and service organizations throughout the world.

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Far more important, you can describe, or mark up, the structure of a document—the logical organization of its constituent elements (e.g., chapters and sections)—in such a way that the description is never lost, no matter what target systems the document ends up on. Such documents can be transmitted in their source form over networks or can be exchanged with dissimilar systems. Later, you can reconstitute the documents in any format you desire. Because source documents are pure ASCII, a single text-retrieval engine can index, search, and retrieve them with great facility, even if you used several software products to create them. However, any software that creates, converts, or interprets such documents must adhere to the same nonproprietary SGML standard. The payoff that most industries are seeking is universally shareable information (see "SGML Frees Information" on page 279).

The Big Picture

There is another, greater payoff to be obtained from using the technologies outlined in this article. Although the benefit is hard to nail down and evaluate in terms an accountant might immediately appreciate, it promises enormous strategic advantage: the ability to create organizations capable of learning from their hardest-won insights and most egregious errors. Paradoxically, this potential advantage is inextricably linked with the perceived drawbacks of these same technologies: None of the technologies are particularly easy to implement. Concept-based text retrieval, hypertext, document assembly, SGML, and even CIMLINC's applications synthesis tools are simply not plug-and-play sorts of things. All require knowledge they cannot themselves supply. This is simultaneously their best and worst aspect: They make people think.

The search for push-button solutions has yielded little of lasting value. Promises of intelligent systems have often been responsible for the perpetration of grotesque stupidities. There is no magical, sacrosanct, or immutable knowledge that can be packaged and delivered to the corporate doorstep to protect organizations from their own ignorance. Ignorance results solely from a failure to learn—a weakness for which there is no known technological cure. The deskilling that resulted from much "advanced" automation serves as a good example: Corporations' ability to learn quickly atrophied when they didn't seem to care any longer what workers knew. Management only wanted to know enough to automate jobs away.

Companies facing the intense pressures of international competition must begin caring again—and soon—about what everybody knows. They must encourage the open exchange of information by every means possible and forge new corporate cultures based on collegial discourse and collaborative exploration. This isn't easy, but it is necessary. Without such thoughtful discourse and engaged collaboration, innovation comes to a halt.

The tools described in the following articles substantially increase access to a multifaceted constellation of narrative information resources. They can enable valuable old stories to be told through new channels, and new stories to emerge where, for most organizations, only silence has reigned since the second industrial revolution. Listen to what the people are saying; you can't afford not to. For good or ill, a third revolution is in the air. ■

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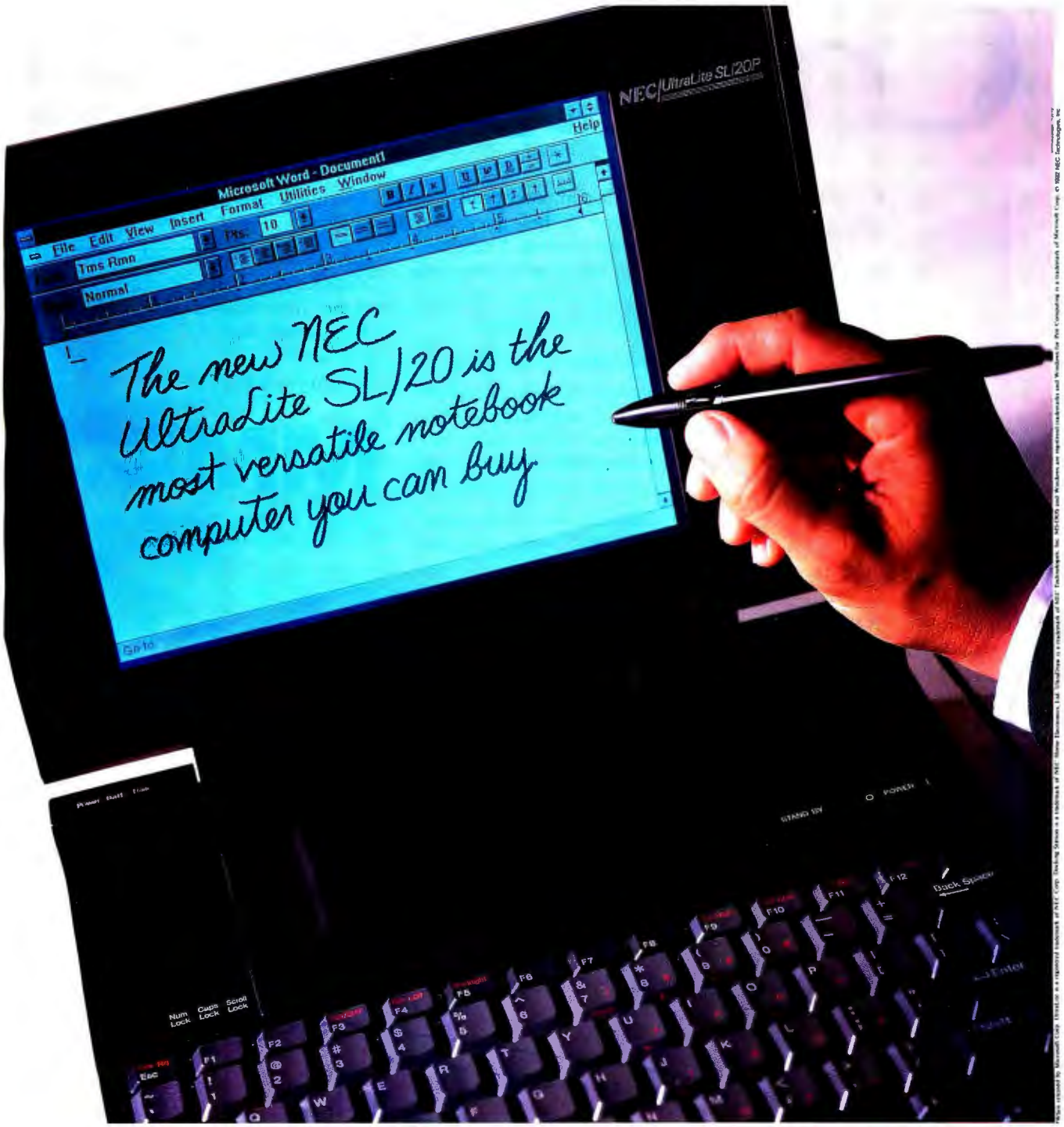


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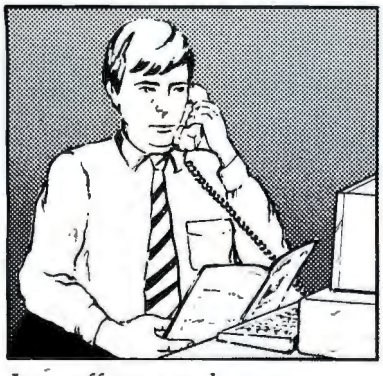
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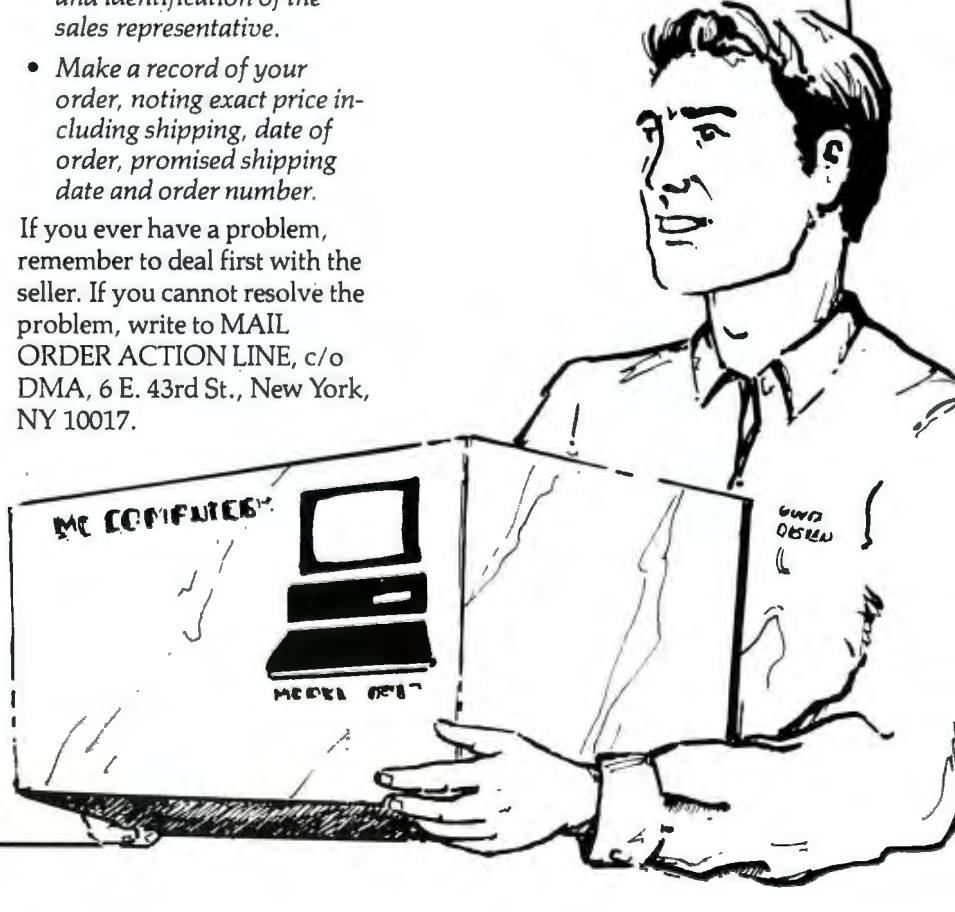
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THE NEW AGE OF DOCUMENTS

Imagine a world where the document is the center of things and applications and operating environments are merely tools for document interchange

JOHN E. WARNOCK

Think about how you work. Business professionals spend roughly 60 percent of their average workday dealing with documents—newspapers, newsletters, magazines, financial reports, memos, and so on. Every morning your desk is stacked with all kinds of paper. You read the documents, annotate them with Post-it notes, and forward them to other people.

Computers don't help you read or manage your documents—they create more of them. All the generic applications create paper documents as their final product. Paper is the communication medium. Even if you transmit a document electronically by means of fax, you still probably start with paper.

In today's world, if you wish to communicate a message directly between computers, you most likely use ASCII text, the least common denominator of computer-to-computer communication. You may not be able to reliably communicate more complicated information because the receiver may not be able to read it.

Because of the diversity in computer operating environments, it's hard to imagine that all the machines could communicate with one another. Today's computer world revolves around applications and operating systems. To transmit a document to someone else, the receiver's operating system, application, and resources must be compatible with yours. If the document's form and content depend on several applications, the receiver must have all of them.

If computers could directly and routinely communicate all the documents that computer applications create, communication would be more timely and efficient.

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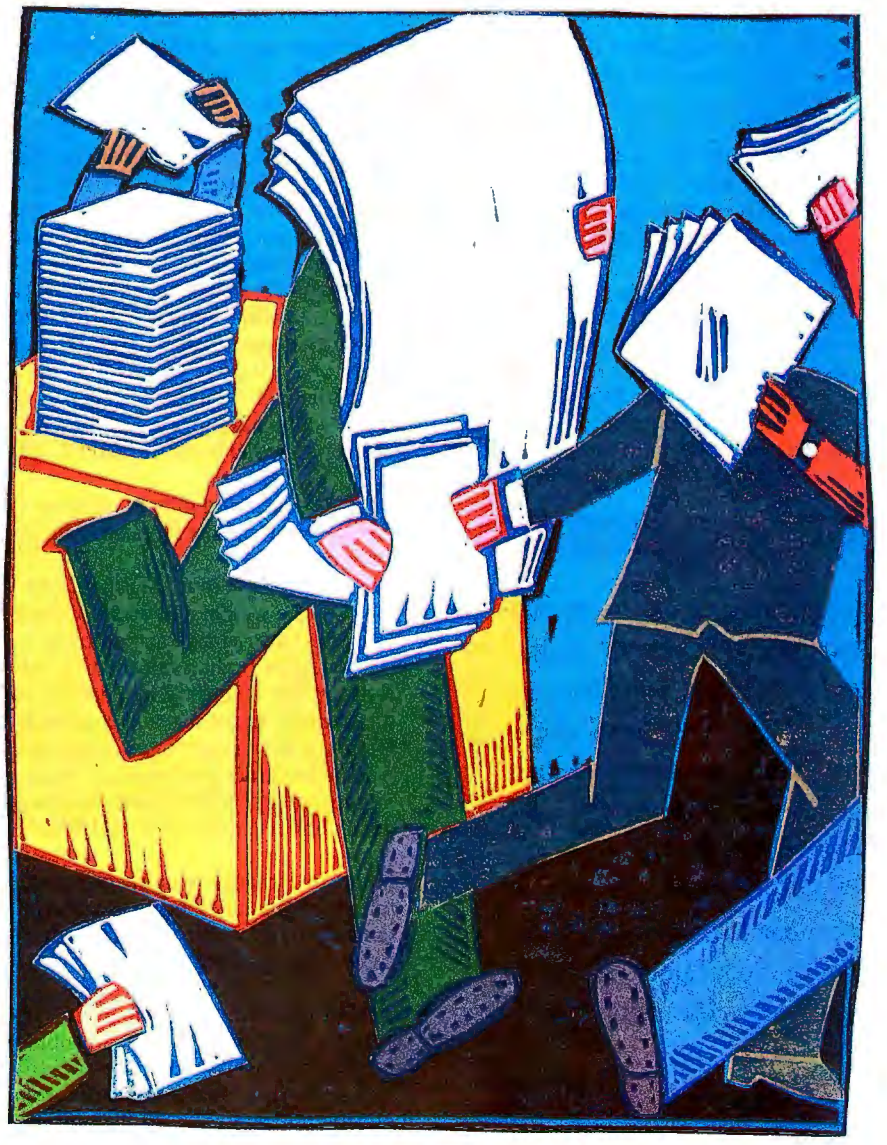


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You would use your computer primarily to read, search, and print portions of electronically distributed documents. Documents would become active elements of communication.

As a primary communication tool, computers would become as indispensable as the telephone. Imagine a world where the "virtual document," the active structured information you are communicating, is the center of the computing universe and applications and operating environments are merely tools to enable document interchange.

Technical Barriers

Barriers to document interchange are the result of a highly competitive and heterogeneous industry shaped by proprietary interest groups bent on accomplishing specific goals for their own products. Thus, performance and functional priorities make most applications platform-specific to a degree that blocks easy document interchange. In addition, there are no effective standards for such communications.

Networking companies have helped the situation by enabling standards that allow data interchange between platforms. But *data* interchange is not *document* interchange. You must still manipulate the data with an application in order to create a final product.

Unrealistic requirements for common resources effectively block document interchange. Most large corporations have mixed computing environments, using mainframes, minicomputers, workstations, and personal computers. Groups within a company have different needs and, therefore, buy different kinds of equipment. Some people prefer Macs, some like PCs, and others choose workstations.

Diversity may also occur within a consistent operating environment. For instance, Joe may have a black-and-white small-format display with 1 bit per pixel and a computer with limited memory, but his neighbor June has a large, full-color 24-bit display with a system that has lots of memory.

Today, everyone's equipment, systems, fonts, memory, displays, and applications must almost be in lockstep to be able to exchange documents. This may be acceptable for a specific mission-critical application, but it's hopelessly unrealistic for a general business environment.

From time to time, utopian visions of reducing the differences between platforms and moving toward comprehensive compatibility arise. In these visions, everyone moves to a common hardware architecture and a common operating environment. Some people say that Microsoft Windows should be the common environment; others support OS/2; still others say the Mac operating system is the way to go; and workstation vendors choose any of various flavors of Unix.

However, the same competitive priorities that created today's diversity make the chance of adopting a broad single platform essentially nonexistent. The diversity of environments inhibits effective communication among them. And applications tend to use system resources that are incompatible with other environments.

The technical demands of compound documents further complicate the issue:

- Text, graphics, and images all have unique requirements for successful interchange.
- Text interchange must deal with font metrics (the weight and width of each character) that change according to typeface, positioning information, tab settings, line and paragraph breaks, and different character sets and encodings.
- Graphics interchange must accommodate paths, structured graphics, painting operations, graphic state modifiers, device-independent color, and Bézier curves.
- Image interchange must specify data for sampled images, or masks, and parameters (e.g., width, height, depth, color space, and compression).

When documents contain sound and video, as they undoubtedly will, the problems will only increase.

A successful, comprehensive document-interchange solution that can handle the different demands of text, graphics, and images ought to come from document architectures that have a life outside of and across operating-system and hardware platforms. You need an architecture that transcends the boundaries of computer environments and emphasizes the independence and completeness of the *information's* structure.

A Real-Life Experiment

When Adobe Illustrator was under development, one of the design goals was to make the intermediate file format the same as the print file format. Adobe used the PostScript language to describe both the appearance of the printed page and the semantics of the editable objects that the application manipulates. Because the first Illustrator product dealt with simple graphic objects, this ASCII file format was not very complex and had many advantages.

After releasing Illustrator, Adobe discovered that you could easily pass the intermediate files that Illustrator created to other applications. These other applications could insert, scale, and rotate the illustrations in the documents they were producing. Because the illustrations were PostScript language fragments, a receiving application didn't have to understand their contents to print the document. It merely had to pass the fragment to the printer.

Other applications that primarily deal with illustrations (e.g., Aldus FreeHand and CorelDraw) can read the semantics of Illustrator files. As a result, most device-independent clip art is stored in Illustrator format. Illustrator and its output file format have provided a real experiment in document interchange.

With the release of subsequent versions of Illustrator, the complexities of its editable objects have increased. For example, Illustrator 3.0 supports complex text objects, but it does not handle multipaged documents, style constructs, reference constructs, and general image manipulation.

The PostScript language has the potential expressive power to abstract the semantic objects needed to implement a complex editor while preserving the exact layout and appearance of the document. Illustrator 3.0 uses a format that is independent of operating system, hardware, and device and has many of the desired properties of a good document-interchange language. Adobe intends to generalize these concepts to build the foundation of an extensible document-interchange strategy—and hopefully a useful standard.

Standards and Practice

A discussion of most current and past attempts at document-interchange standards

BYTE ACTION SUMMARY

If computers could directly and routinely communicate all the documents that computer applications create, communication would be more timely and efficient. You would use your computer primarily to read, search, and print portions of electronically distributed documents. Documents would become active elements of communication.

Matching Fonts

The handling of fonts is a fundamental problem in document interchange. Consider the following example. Terry produces a document using fonts from the Utopia and Futura type families (see figure A). Terry sends the document over a network to three coworkers, who immediately print the document. The catch here is that none of the people receiving the document have the fonts that Terry used in the original document. There are a number of ways to deal with this problem.

The most common solution would be to print the entire document in the printer's default font, Courier (see figure B). Courier is a monospaced font, so a line of type takes up more horizontal space than it would with a proportionally spaced font (e.g., Utopia). As in figure B, this often results in words running right off the edge of the page. The overall look of the text is also different, so the reader has no sense of how the original document looked.

A second solution would be to substitute available fonts for the original fonts. In Terry's document, Utopia is a serif typeface, and Futura is sans serif. Other serif and sans serif fonts could replace them. However, the metrics of the font differ from one font to the next. Although this document would be easier to read than the Courier version, it would not maintain the line and page breaks or the overall look of the original document.

A third way to solve the font problem would be to bundle the fonts with the document before sending it over the network. This approach would ensure that the receivers see the document in its original form. However, although the document itself may only be 3 to 4 KB in size, the fonts that go with it could push that number to over 120 KB, slowing the network to a virtual crawl.

Another approach, using Multiple Master fonts, provides a more efficient method of document interchange. Using variables of character weight and width, a Multiple Master font can closely match the fonts used in the original document (see figure C). Thus, between the original and the received documents, line and page breaks are identical, and the overall look of the text is the same.

You can use one Multiple Master font successfully for font substitution because it matches all the document's original fonts on a character-by-character basis. In addition, this approach minimizes overhead because only the font metrics (typically less than 1 KB per font) need to be transmitted with the document.

Based on Adobe's open Type 1 font format specification, Multiple Master typefaces are compatible with existing technology. Each Multiple Master typeface enables you to create a large selection of fonts using a design matrix based on one or more variables of weight, width, size, and style—weight and width are by far the most widely used variables. You are able to generate any instance within this matrix using any combination of the included variables.

Today, a typical font family includes several weights (e.g., light, regular, bold, and black) and perhaps one or more variations in width (condensed, normal, and/or expanded). You are limited to the choices available in the font family, or you can resort to software that artificially bolds, lightens, expands, or compresses an existing design. These processes distort letter shapes and proportions, which can adversely affect the legibility of the text and distract the reader.

Multiple Master typefaces let you select the weight, width, size, and style of typefaces that will best suit your needs as well as provide you with systems-level solutions in document portability.

Multiple Master Fonts

Because a Multiple Master font can produce a wide range of typeface variations, it can precisely match the copyfit of a document created in an entirely different typeface, even though designs of the characters in the Multiple Master font might have little in common with those of the font it's trying to match.

Figure A: *The original document uses a mix of serif and sans serif fonts.*

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Figure B: *Using the default printer font results in the loss of the original look of the document.*

Multiple Master Fonts

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Figure C: *Multiple Master font technology retains the metrics of the original fonts to preserve the look and spacing of the original document.*

would shed little light on how to address the problem practically. Most attempts to define standards by committee are plagued by the need to reach agreement among many different interest groups and factions. Compromises are made, and the result is often a "paper standard" that is too abstract and complex to be practical or has wandered so far from the original objective that nobody wants to implement it.

This indictment of traditional standard-making processes in no way implies that the members of standards groups are not trying to do the right thing or are not sincere in their desire to offer a solution. Many of the efforts of the individuals are very good technically. It's the process itself that is flawed.

Establishing effective standards means building something that solves the problem in a practical way, serves the needs of the user community, is general enough to be extended into the future, and is not proprietary. The market will decide when a solution is real.

After the market has accepted a solution, formal standards groups should convene to clean up, endorse, and codify the standard. This is the market-based strategy that Microsoft used to establish the DOS standard and that Adobe used to establish the PostScript-language standard.

A Document-Interchange Road Map

Establishing a viable document-interchange strategy is a two-phase process. Both phases are necessary to avoid the catch-22 that bedevils new technology: Who will write applications to support a format that doesn't have widespread use? And who can use a format that doesn't have widespread application support?

The first phase requires enabling the majority of computer-generated documents to be transmitted, viewed, and printed across diverse platforms. This phase must be independent of the specific interests of any one vendor of operating environments or hardware architectures. Once accomplished, the user community will see the value of communicating documents electronically.

When electronic communication of documents becomes commonplace, the applications that make it easiest and that best exploit the interchangeable-document format will gain in popularity. Demand will drive normal market forces to proliferate the format. In other words, create a format that works and has practical value to the end user, and that value will drive the market to the common format.

The goal of the first phase should be to capture documents from existing applications in a way that is independent of device, operating-system, and hardware. Fortunately, modern windowing environments provide a common, device-independent interface between the applications and the operating-system imaging models. And these imaging models have interfaces to printer drivers: Graphics Device Interfaces in the Windows environment, QuickDraw interfaces in the Mac environment, and Graphics Programming Interfaces in the OS/2 environment.

One approach is to develop specialized printer drivers for each environment that will capture the output from applications and convert it to a single, uniform document-interchange format. With this format, you can write document viewers and printing utilities for each platform. A collection of such drivers, coupled with viewing and printing facilities, will enable the initial communication of documents between diverse platforms without changing existing application programs.

This is the course that Adobe has taken with its document-communication technology, code-named Carousel. Applications create Carousel documents by sending their output to a printer driver containing a Carousel module.

In environments that support device-independent printing, any application that prints can create a Carousel document. In the DOS environment, you can convert PostScript output files to Carousel documents with a utility program. Thus, only DOS applications that support PostScript can create Carousel documents. Of course, about 5000 applications on all platforms now support PostScript, so this isn't a very onerous restriction.

One of Carousel's fundamental concepts is that you should be able to work with electronic documents in the same way that you work with paper—and still be able to take advantage of their being computer files. Carousel documents are, therefore, partitioned into pages that you can read with a viewer application, just as you would read a book or a magazine.

However, unlike paper, the Carousel viewer lets you attach electronic notes, search for specific words or phrases, and create active links between an outline and a document and between different parts of a document. These links let you navigate around a document in many ways. As Marshall McLuhan might say, Carousel has taken its initial content from the paper medium, but it extends this content using the capabilities of the personal computer.

Because Carousel is page-oriented, it's important that the documents it handles retain the format of the original document. The most difficult aspect of this task lays in handling fonts. Carousel uses Adobe's Multiple Master font technology to ensure that documents retain as much of the look of the original document as possible without needing to contain the actual fonts used in their creation (see the text box "Matching Fonts" on page 259).

Beyond Carousel

Carousel technology represents an initial step toward portable documents. In this step, some of the information relating to the objects in the application are lost in the communication to the print driver. For instance, the relationships between the numbers in a spreadsheet are lost when the spreadsheet is formatted for printing.

The loss of information doesn't prevent you from using a common document-interchange format to communicate the *appearance* of the document. Later, as application programs support document interchange more fully, object semantics can be inserted into the interchange format. Then you can realize the full communication potential of document interchange as you edit the same document across diverse platforms and applications.

The second phase to document interchange is to build powerful applications that use a common document-interchange format and to leverage the cross-platform sharing of object semantics that such a format would allow. These applications should demonstrate how document interchange and common editing structures can work and how the use of the extension techniques can add semantic information to the standard. If these applications give substantial value to the end user, applications developers will build new interfaces to the document-interchange drivers, and a new standard, both real and useful, will appear.

In looking to the future of computing, people must focus on the abstractions of information and how they use those abstractions to communicate ideas effectively. Computers shouldn't be the center of our attention—the information should.

Documents are abstractions of information that have been refined in many ways to communicate ideas. To date, the document is one form of information that remains difficult for personal computers to communicate. It's time to expand our horizons. If computers can do anything, they should be able to effectively transmit and receive that basic staple of our information diet: the document. ■

John E. Warnock is chairman and CEO of Adobe Systems (Mountain View, CA), which he cofounded in 1982 after being a senior scientist at Xerox Palo Alto Research Center. You can reach him on BIX c/o "editors."

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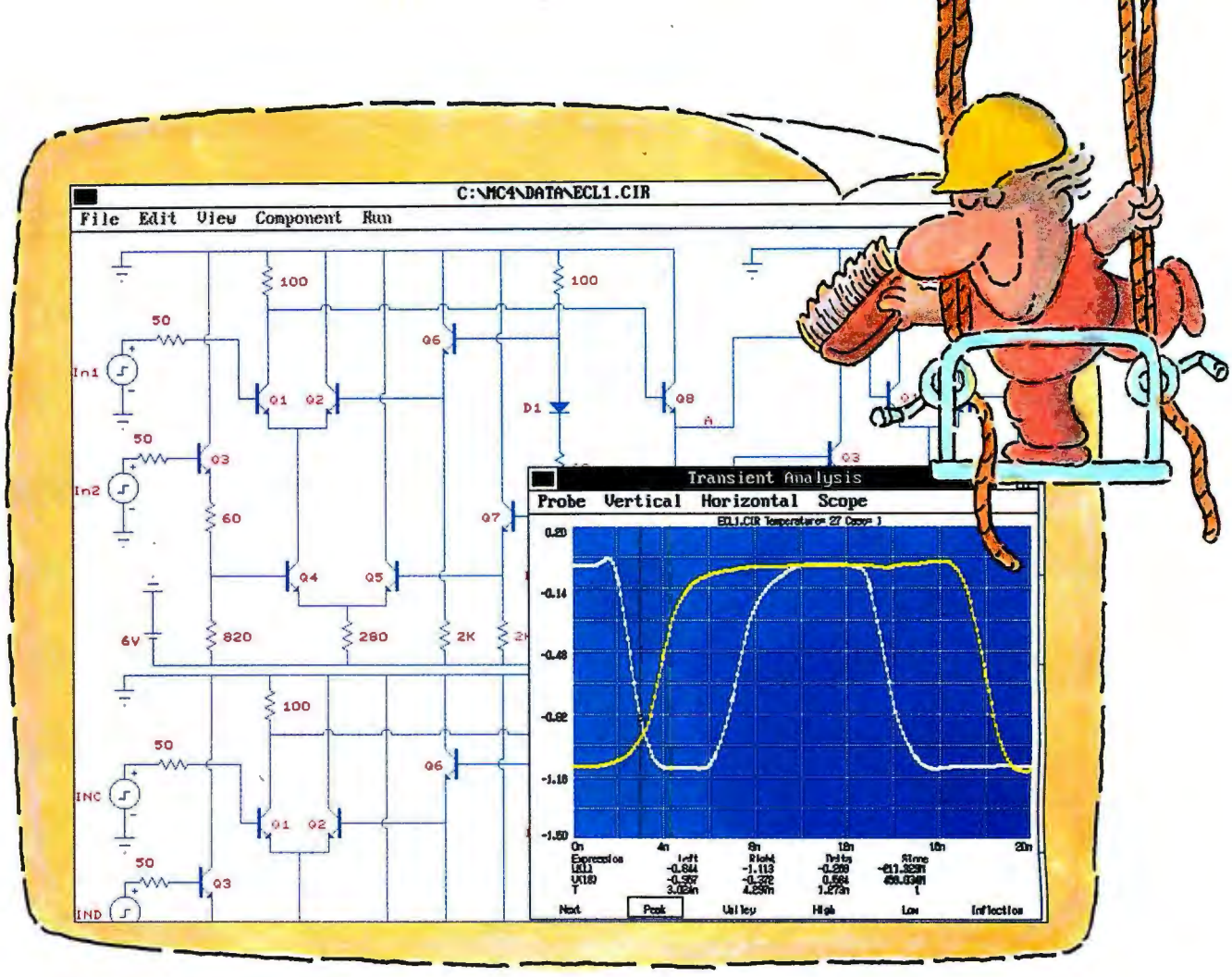
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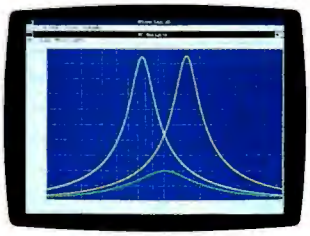
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ELECTRONIC BOOKS

Hypertext publishing lets you structure, distribute, retrieve, and annotate the information you need

LOUIS R. REYNOLDS AND STEVEN J. DEROSE

Soon, you won't have to worry about running out of space on your bookshelves, and you will not have to carry those heavy boxes of books from one house to another when you move. In the near future, you will see a great many of your favorite books available on disk. Electronic books are fast coming into being.

Over 25 years ago, Andries van Dam, pioneer in user-interface languages, coined the term *electronic books*. It refers to interactive live documents that you can create and read on a computer. Electronic books preserve the best features of paper documents while adding rich, nonlinear information structures (often called hypermedia) and interactive user-controlled illustrations.

Recently, a number of vendors introduced hand-held computer devices that allow you to read large documents on-screen and output them as hard copy. In the meantime, software is appearing that uses modern high-end display capabilities so that you can easily and comfortably read books in electronic form.

In theory, electronic books have been possible for decades. The concept goes back to at least 1945. Pioneering systems began appearing in the 1960s, but at that time, only mainframes had the required speed, storage capacity, and display quality. In the late 1970s and the early 1980s, second-generation systems appeared on more affordable hardware, but you could create only simplified documents with them.

Recent technological advances have made it possible for the new medium to exceed the capabilities of paper, and now new systems will offer dynamic electronic



ILLUSTRATION: RANDALL ENOS © 1992

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books that fully utilize your computer's strengths. Electronic books will be made possible by the combination of powerful processors; high-density storage; and interchangeable, processible representations of text, graphics, and multimedia documents.

Until now, desktop publishing had principally focused on paper output. The electronic medium, however, has numerous unique strengths. Some of the newest electronic-book systems make use of those strengths rather than merely imitate paper.

BYTE ACTION SUMMARY

On a rainy afternoon, you may want to turn on your computer and read the newest Stephen King best-seller. Before long, using SGML technology, good software, and some future interchange standards, your computer will provide you with a library of unlimited size and variety.

Importance of Electronic Delivery

People need a strong motivation to convert from a familiar, established method to a new way of doing things. Electronic books provide a significant economic advantage. Companies see electronic books as a way to save on production costs and to improve accuracy and timeliness.

Many firms use large, complicated manuals, which can cost as much as $1000 per copy to produce. On the other hand, a CD-ROM can hold several of these manuals, be shipped in an envelope, and cost under $5 to produce. And the environmental advantages of using less paper are also significant.

Updating paper documents is expensive, time-consuming, and error-prone. Networks can serve many readers with one copy. With the increasing use of networks and CD-ROMs, publishers can provide updates efficiently and as often as needed. Helpful software can even alert readers to important changes.

Maintenance and service technicians can carry a full set of electronic manuals to customer sites. With this capability, technicians make fewer return trips to solve customers' problems. This benefit of electronic publication leads to lower support costs and more satisfied customers.

Early Electronic-Text Pioneers

In 1945, President Roosevelt's science adviser Vannevar Bush conceived of what later became the Memex, a machine that stored huge amounts of text and helped users index and organize the information. He also suggested providing an easy way to make and reuse connections between texts. For this reason, many consider the Memex to be an early forerunner of hypertext. In the late 1960s, actual electronic text systems began to appear.

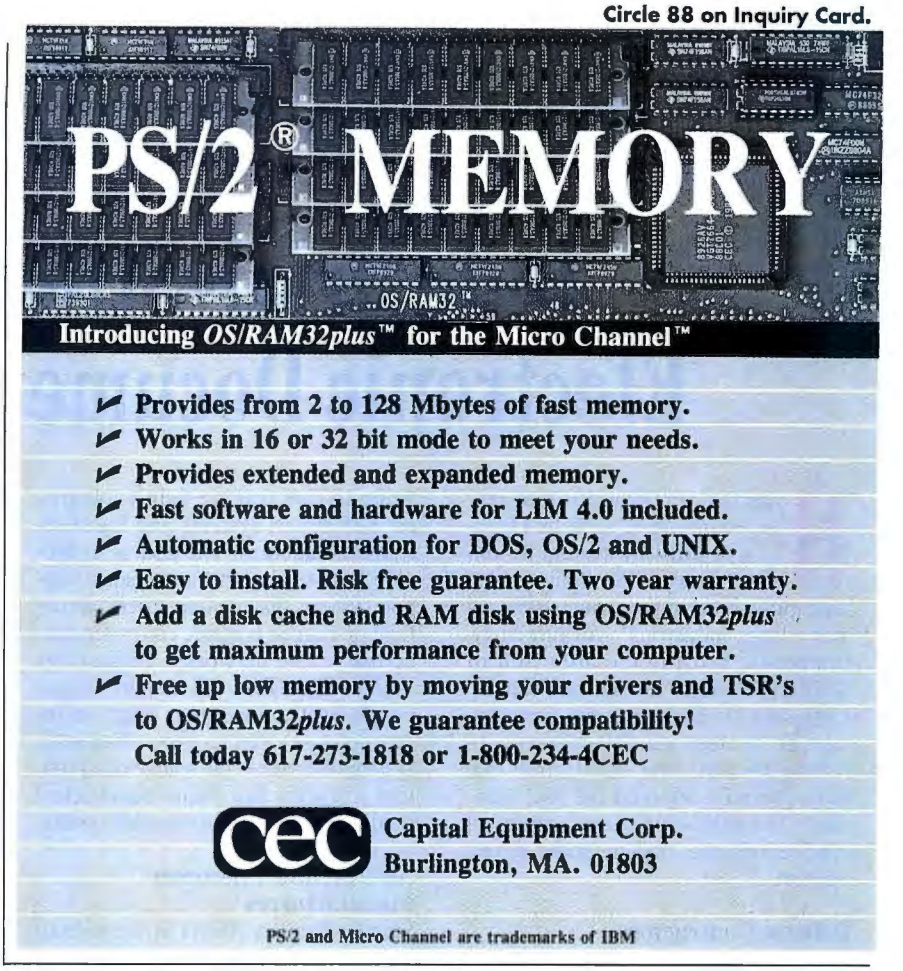
In the early 1960s, Doug Engelbart built Augment for the Stanford Research Institute. Augment is an on-line document environment used for E-mail, collaborative design and writing, and other related tasks. Engelbart's staff did much of its work without paper, creating large and small documents with links, outline-style hierarchical structures, keywords for retrieval, embedded graphics, and a variety of other features. They could even coedit documents in real time across hundreds of miles. The documents they generated still exist and fill hundreds of magnetic tapes.

Around the same time, Ted Nelson (now the head of the Xanadu project at Autodesk) began to write about his vision of a future where all literature would be instantly available to everyone to read, explore, link, and annotate. Nelson created the terms *hypertext* and *hypermedia*, and he contributed to early research on hypertext at Brown University. His team is designing and developing Xanadu, a software environment to make his vision possible.

At Brown, van Dam and his students built HES (Hypertext Editing System) and later developed FRESS (File Retrieval and Editing System), which was a full-featured hypermedia system for unlimited-size documents that built on the insights gained from HES and Augment. FRESS supported WYSIWYG, multiwindow editing, and the then-revolutionary idea of using seamless text rather than fixed 80-byte lines.

FRESS introduced the undo operation and some hypertext capabilities that are considered advanced even today. Text and links had keywords and attributes for retrieval, on-the-fly information filtering, and formatting. FRESS provided the user with multiple document views, such as an outliner, bookmark index, hypertext link overview, and others (all updated when any of them changed). In a number of courses, students read textbooks, wrote papers, and interacted in the FRESS "web." In addition, NASA even used FRESS for Apollo documentation. The system still works today.

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Initial Commercial Attempts

None of the first-generation electronic-book systems gained wide use because they required a great deal of computer power. As time went on, however, computers became more powerful, and another generation of electronic-text systems arose. Xerox's NoteCards introduced the idea of modeling documents as cards and was one of the earliest second-generation systems. It was the forerunner of a variety of tools designed to organize, link, and explore networks of information "chunks." Chunks are very useful, although dividing actual books into meaningful chunks is difficult.

NoteCards shared with first-generation hypertext systems a commitment to large-scale applications and support for hypertextual navigation, but it differed with them greatly in its model for documents. Xerox's application had a significant influence on later systems. Apple's 1987 introduction of HyperCard brought some of NoteCards' technology within the reach of many people. Although it's oriented toward small chunks of information, HyperCard has been used for some interesting large electronic-text projects.

Brown University's Institute for Research in Information and Scholarship developed Intermedia. It is a Macintosh-based hypermedia environment that provides tools for creating, linking, and navigating through collections of documents, including text, drawings, animations, sound and video, timelines, and other media. Later versions of this environment added full-text searching and a dictionary database. Brown and other universities have used Intermedia extensively.

Today there are a number of companies that produce hypertext applications (some of which publishers can apply to electronic-book projects). These firms use various technological approaches for their products, including Guide from Office Workstations (Edinburgh, U.K.), DynaText from Electronic Book Technologies (Providence, RI), and Folio Views from Folio (Provo, UT).

Design Issues

Early systems clarified the major issues involved in building useful electronic texts and explored the key differences between paper and electronic media. You can characterize electronic-text systems by how they handle fundamental issues such as the distinction between an author and a reader and the various types of document models.

Some texts are published as finished documents, after which nobody changes the text. In this case, additions (e.g., marginal notes and highlighting) are easy to distinguish from the author's words. Other texts are never published in a fixed form but are constantly being changed by authors and readers.

Traditional databases depend on repeating identical structures, and card- or page-based systems treat text the same way. But full-text systems must provide multilevel hierarchies, with no limits on size, type, or heterogeneity of nodes. The search function in structured documents is different from that in relational databases because the structure of the elements cannot be established in advance.

Another important issue in electronic documents is how to prevent a user from getting lost. With paper books, you can dog-ear pages or use bookmarks, but electronic books are another matter. Think of your computer screen as a library filled with books that have no covers—the information is in there somewhere, but where? The electronic medium needs to provide ways to match the ease with which you can navigate through paper documents.

Early printers imitated the style of handwritten manuscripts, but they found that what works best in one medium is not always the best choice for another. The same kind of transition is happening in the evolution from paper books to on-line texts. Many computers still have low-resolution displays, and they provide a smaller physical space than a desktop full of open books. On the other hand, on-line text can change to fit your needs and interests—paper cannot.

Differences between types of media mean that systems designed to make the best use of one form may not make the best use of another. Thus, authors and publishers are rapidly adopting descriptive markup systems, which classify and mark parts of documents according to what they are rather than how they appear. For example, a chapter title would be labeled "chapter title" instead of "18 pt. bold centered." Rules then specify the desired appearance of each class of element, and the rules can be designed separately for each medium.

The Holdup

Until now, several factors have held back the development of electronic books. The production process has been very expensive because of the demands for large amounts of processor power and storage. Only recently have truly portable and affordable machines appeared with storage sufficient for several books. Companies with large and complex manuals were the first to adopt the technology because their savings exceed start-up costs.

Another problem had been that very few people had expertise in electronic-book

Industrial-Strength Electronic Documentation

Hypertext applications that rely on technologies such as DynaText (a software system for on-line delivery of electronic books) are rapidly entering the mainstream of many large industries' working environments. Worldwide adoption of SGML (Standard Generalized Markup Language) is hastening the development of the electronic-information-publishing infrastructure in industries that have formally adopted the ISO standard. The following are examples of application areas that are under development.

Defense Contractors

The Department of Defense adopted SGML as part of its CALS (Computer-aided Acquisition and Logistic Support) initiative. The ultimate goal of CALS is to eliminate paper from all phases of a document system's acquisition, development, and field support. In addition to SGML, the Department of Defense has adopted a number of related standards, including an interface standard for what is known as IETM (Interactive Electronic Technical Manual).

Several projects are under way to develop IETMs that are tightly integrated with expert systems and logistics-support databases. The goal is to provide state-of-the-art maintenance support systems that manufacturers can deliver on rugged portable computers and across secure networks. Technology such as DynaText can display chosen portions of a document (e.g., an inspection task) after an expert diagnostic system determines the source of a problem, a process that facilitates efficient field maintenance of a complex system.

Aircraft and Telecomm Manufacturers

Standardization efforts in the aircraft industry have led to the adoption of SGML as the preferred electronic delivery form for aircraft documentation. Airlines and aircraft manufacturers are waiting for the day when they can obtain all their manuals electronically. The results of this process would streamline the updating of the manuals and improve safety.

This type of technology is enabling development of electronic delivery systems for everything from in-flight operations manuals that pilots view in the cockpit to electronic maintenance manuals that service people could use on hand-held work slates in a maintenance hangar.

The TCIF (Telecommunications Industry Forum) has adopted SGML for use by equipment manufacturers and service suppliers. This implementation will facilitate the on-line delivery of the voluminous technical documentation associated with complex telecommunications equipment. The acceptance and widespread use of SGML effectively enables carriers to enter the electronic-information-delivery business.

Miscellaneous Applications

Some industries have not yet formally adopted SGML. Nevertheless, some firms are using technologies such as those found in DynaText for academic publishing, on-line help systems, information gathering and analysis, and field-service training.

To meet the diverse requirements of all these application areas, a successful product must provide a flexible and open architecture. The product must be able to handle arbitrary SGML (Document Type Definitions) and industrial-strength and -size applications.

production. Implementing a project from data entry, encoding, and indexing to designing an effective user interface requires many skills. Some expertise from paperbook production translates directly, but much does not. And, as in any new field, it takes time to develop stylistic conventions and effective presentation methods.

In addition, the lack of agreement on document representations had retarded progress. Each system has its own format, and beyond moving raw text, only a few have interchangeable format capabilities. It's often difficult to move documents between publishing systems without custom conversion filters, and most of these filters lose important information along the way (e.g., style-sheet information and equations).

Why Now?

Companies are publishing electronic books now because they have begun to solve many of the technology's major problems. Books used in offices offer greater benefits because they can be distributed on networked workstations that have superb display quality and virtually unlimited storage. Producers of large and expensive books will find that electronic delivery is cost- and time-effective because the new personal computers have tremendous power—some small notebooks weigh less than paper books, and they can store more information.

Start-up costs have dropped significantly for publishers and for those buying the reading hardware. In many cases, mastering a CD-ROM costs less than typesetting a book. Nearly all publishers prepare new documents on-line. Scanning and automatic-tagging technology (e.g., Avalanche Technology's Fasttag) are accurate enough for many retrospective conversion jobs.

Finally, and very importantly, there has been rapid movement toward standards for document representation. The centerpiece of this movement is SGML (Standard Generalized Markup Language), which became a formal international standard in 1986 (ISO 8879).

Information Publishing Standards

Authors and publishers have long struggled with the problem of interchanging documents between processing systems. An author who prepares a document using

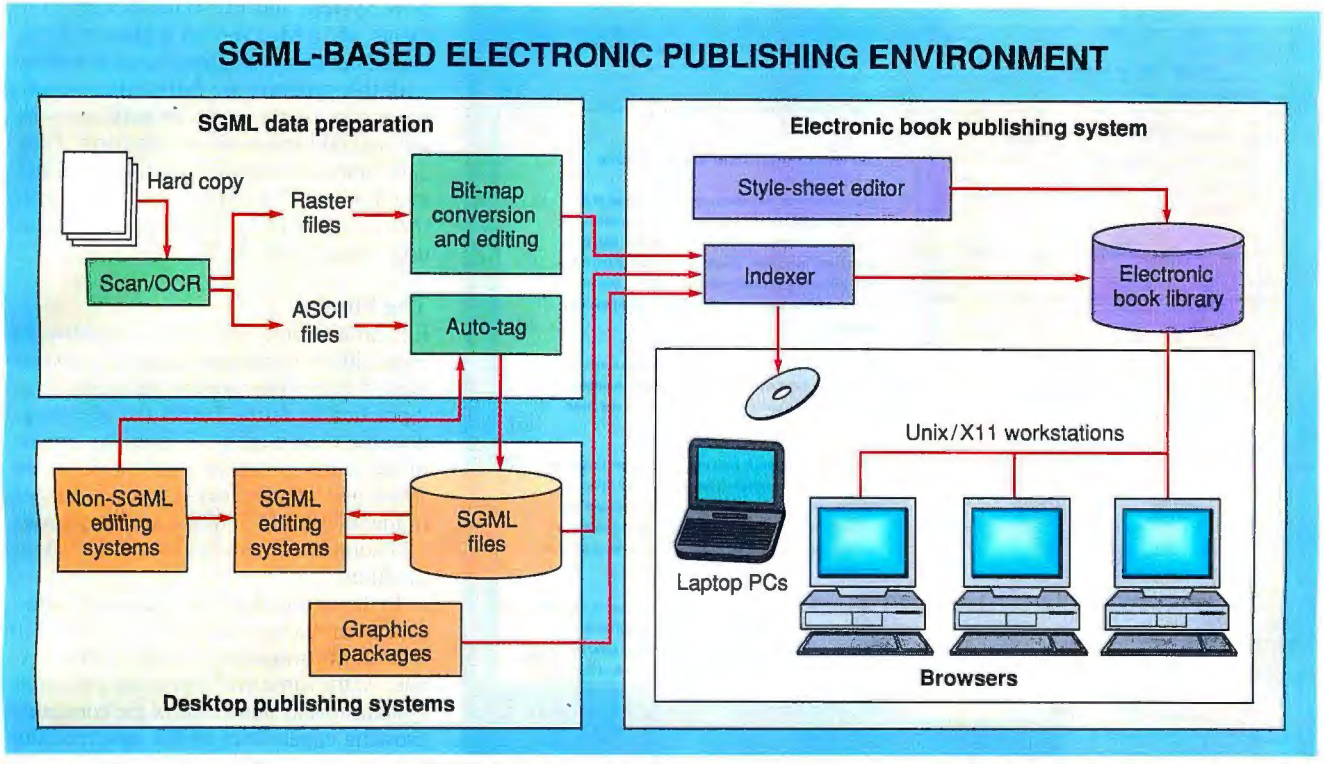


Figure 1: *The structure of an integrated, SGML-based paper and electronic publishing system. Once in SGML form, data is fed directly to DynaText for electronic delivery on Unix networks and portable PCs.*

one program often cannot send the document to a publisher for editing on another system or exchange the document with a coauthor. Word processing tools seldom allow document storage in ways that permit their reuse for other applications (e.g., cataloging, information retrieval, and electronic delivery).

The more publishing a company does, the more it must deal with these problems. As a result, many major industries have adopted SGML since the ISO's formal approval of the standard, and the trend is continuing. This move has strongly motivated software vendors to support SGML (although they do so in greatly varying degrees).

In 1987, the Association of American Publishers started the trend toward the use of SGML by designing an SGML tag set for books and journals, which has become an ANSI standard. In 1988, the Department of Defense declared that, for eventual use in interactive electronic technical manuals, contractors must deliver all documentation for future weapons systems in electronic form, with the textual portions in SGML.

In 1989, the Aircraft Industry and Air Transport Associations followed the Department of Defense's lead and developed SGML tag sets for aircraft maintenance and operations manuals. This process helped to unify and streamline operations in the industry because many vendors sell both commercial and military aircraft. In 1990, the Telecommunications Industry Forum developed SGML applications for systems documentation, information interchange between vendors, and several other applications. In 1991, the computer industry geared up, too, when various Unix system vendors got together to develop SGML encodings for on-line documentation.

At the same time, academic researchers also adopted SGML. The TEI (Text Encoding Initiative) is a widely supported international effort to standardize the encoding of literary and other texts. Various groups are preparing collections of texts (totaling gigabytes of data) tagged according to the TEI guidelines.

SGML Technology

To build electronic books in SGML, you need several pieces of technology, all of which have become available in the past few years (see figure 1). The first component of an SGML-based electronic-book environment is an authoring system, with which writers create and edit documents. SGML-based authoring systems either typeset documents directly or export them to a formatting engine.

It's essential that an authoring system support SGML. Consider a document in which part numbers, emphatic words, and book titles have distinctive tags (perhaps to permit sorting or searching), although each element also appears in italics under current printing rules. If an authoring system only records formatting, as many do, there is no way for the system to recover or use the distinction between elements of the document—all three things have become just italics.

Often a publisher or an author will have data that is not in SGML and will need conversion tools (once it's in SGML, it is usually easy to convert it into other formats—another reason SGML is useful). Manual-tagging and global-change commands are only sufficient for small projects. Making hypertext links (e.g., converting documents) shouldn't have to be performed by hand.

The final component of an SGML publishing environment is the electronic-book delivery engine. When the data is ready, the interface is the tool readers use to view it. The interface is crucial to the success of an on-line book project. It must have a familiar paper-like feel.

The interface must provide as many advantages of paper as possible but not have its limitations in areas where displays are superior. It must handle documents in the tens to hundreds of megabytes and still

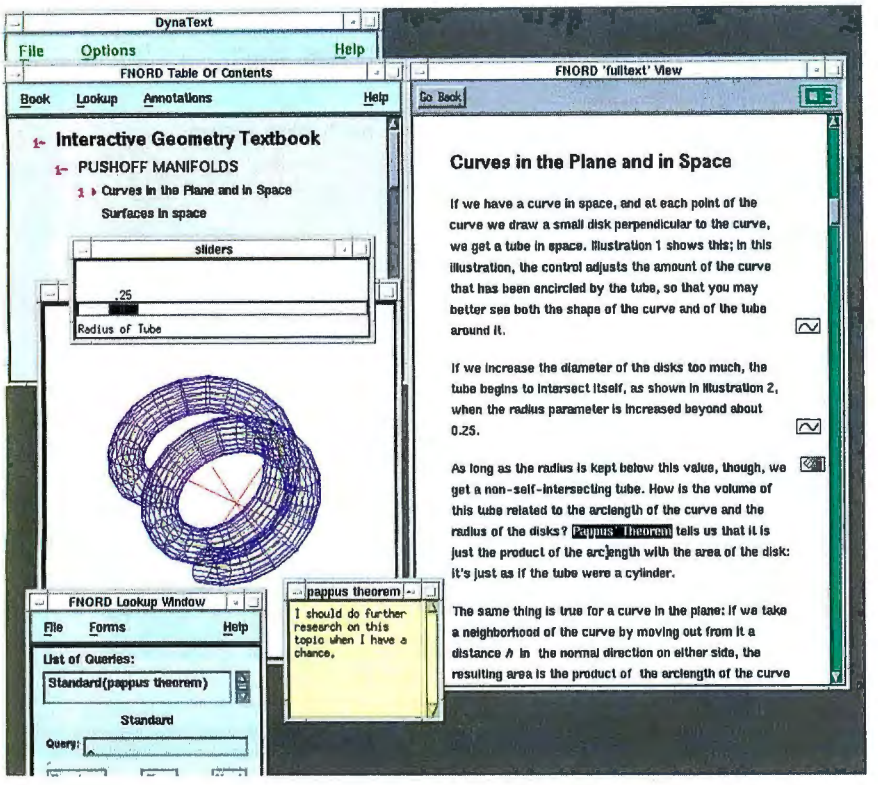


Figure 2: *Running on a Unix workstation with Motif, the display includes a hierarchical table of contents window and a full-text view with several link icons. The reader has searched for the phrase "Pappus' Theorem" and clicked in the table of contents to scroll to the section on curves. The reader has followed a link to an external, interactive three-dimensional modeling program that illustrates the theorem. Finally, the reader has created an electronic note as a reminder to do additional research. The Brown University Graphics Group prepared this interactive textbook. (Courtesy of Electronic Book Technologies)*

respond quickly to a user. In addition, SGML's fundamental idea of descriptive markup (as opposed to markup for particular processing or layouts) provides a clear path to the multimedia document environments of the future.

A New Breed

DynaText is a software system for on-line delivery of electronic books. It allows you to display information in various forms and uses CPU cycles to do more than put bits up on a screen.

An effective electronic-book delivery program relies on the strength of SGML's descriptive markup approach: separation of the format from the content. It preserves the SGML structure throughout a project rather than translating this structure into specific formatting. By using a product such as DynaText, publishers can take full advantage of SGML's expressiveness—including arbitrary DTDs (document type definitions)—for both paper and electronic delivery.

With DynaText, publishers are able to display any number of document views simultaneously, each formatted according to its own particular style sheet rather than one predetermined, static view. Figure 2 illustrates a number of these capabilities.

DynaText also uses the SGML markup to represent hypertext links. Thus, by using style sheets, publishers can define the behavior of SGML elements. For instance, footnotes and tables can be either displayed in-line or tucked away behind hypertext links for retrieval by a simple click of a mouse. Publishers can use a set of built-in link-script properties, or they can define their own link behavior (e.g., launching an external program such as a multimedia viewer).

This application provides a systems-integrator toolkit that lets programmers create customized user interfaces and use the toolkit's capabilities for SGML navigation, retrieval, and display (see the text box "Industrial-Strength Electronic Documentation" on page 266).

DynaText runs in both Unix/X Window System and PC/Windows environments, and a Mac version is planned for release later this year. Documents published with this program are fully data compatible across all platforms, so publishers are not locked in to only one platform. They can index documents on high-end Unix machines, for example, and then deliver them on CD-ROM-equipped PC/Windows portables.

The Future

Recent advances in display and storage capabilities, hypertext research, and standards for information representation make it practical to deliver books and other large documents in electronic form. As a result of the early research performed in the 1960s and the practical systems developed in the 1970s and 1980s, electronic books will soon become a common publication medium.

In the world of electronic books, workable interchange standards are crucial to making information accessible to everyone. At the same time, open and extensible systems to take advantage of the constantly growing capabilities of this new medium must be developed. To achieve this state, publishers and software developers must strive for better agreement on representations for graphics, video, and style specifications.

A number of standards are under development. The crucial ISO HyTime standard encodes hypertextual, temporal, and spatial information (this ISO standard should be formally approved by the time you read this article). DSSSL (Document Style, Semantics, and Specification Language) specifies formatting rules. Multibyte character codes represent most languages in a single set. Additionally, other standards are being developed to represent fonts, colors, and so forth.

As systems are designed for the electronic medium, people must take advantage of the strengths and overcome the weaknesses of the paper and the electronic forms. To reach this goal, people must have a good understanding of both media and commit themselves to finding new and better ways of presenting information on-line. ■

Louis R. Reynolds is president and CEO of Electronic Book Technologies. Steven J. DeRose is senior systems architect at EBT and chair of the Text Encoding Initiative's Hypermedia Working Group. He has worked with hypertext systems since 1979. You can reach them on BIX c/o "editors" or on Internet at lrr%ebt-inc@uunet.uu.net and sjd%ebt-inc@uunet.uu.net, respectively.

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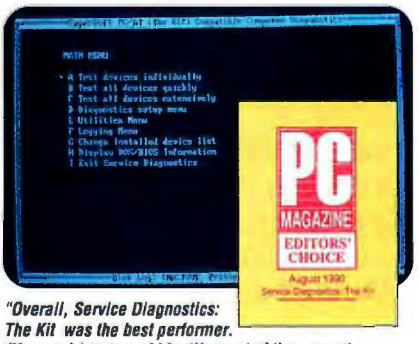
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SEARCH AND RETRIEVAL

How to evaluate large text-retrieval systems

EARLENE BUSCH

Managing text is much like managing children. When children are small, the parent has almost total physical control over them and can get by with simple management techniques—feed them regularly, change their diapers, and put them down for naps. As they grow, however, children are influenced by friends, reject family rules, and take on characteristics of their own—characteristics often not anticipated by the parent. Managing them becomes more complex and qualitatively different.

In a simple information management scenario, you have limited information to manage at your desk (hard copy and/or electronic)—a file of business contacts, a daily log, and several folders. You can easily retrieve the list of business contacts and the daily log by using a structure of formatted data (e.g., name of the contact, date on which the log entry was made, and company name). Accessing this type of information poses no organizational problems. You name the documents in the folders by assigning each one a keyword or phrase and a date or name. To find something, you simply review the keywords and phrases associated with the files and pull out those that appear to be relevant. This system uses one source, idiosyncratic information management schema, and a few documents. The management tasks are predictable and straightforward.

At the other end of the spectrum is the in-house or commercial document base. Whether delivered on-line or on CD-ROM, the task of retrieving information involves various information sources, a standardized information management schema, gigabytes of text, and many concurrent users. In contrast to the familiar system at

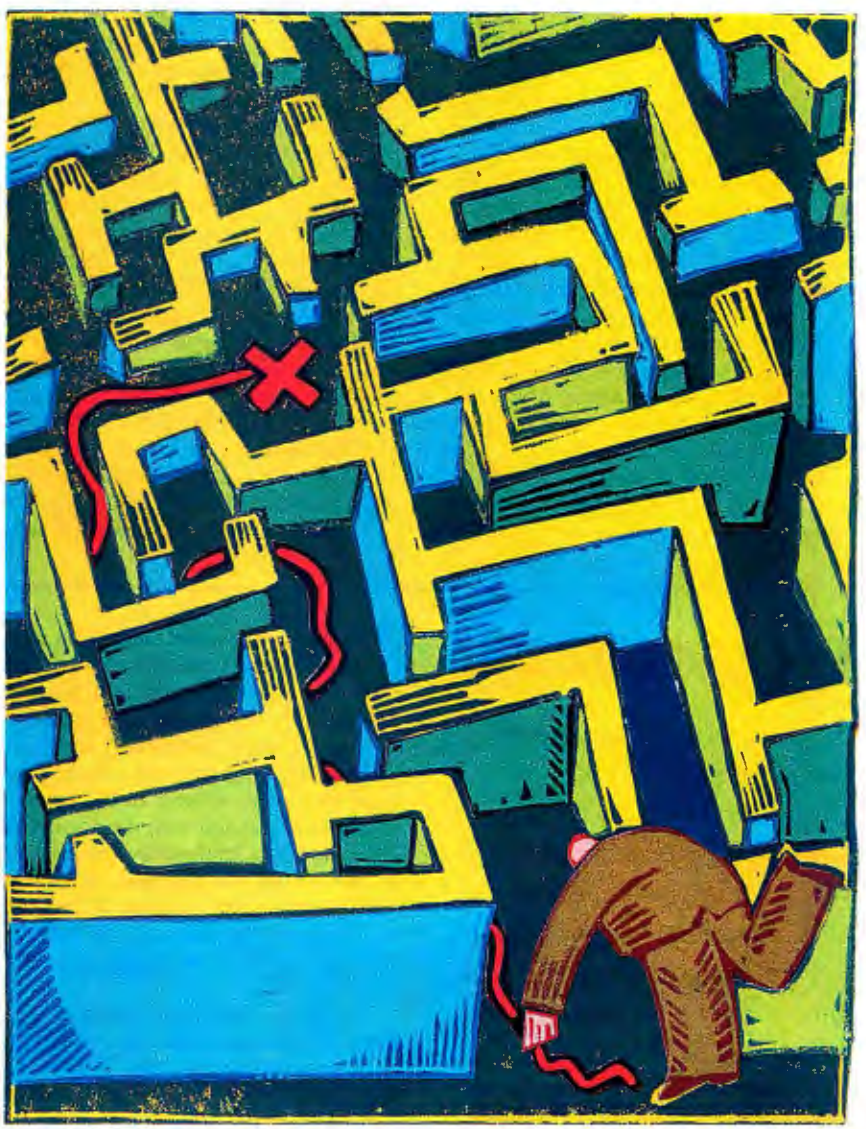


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Document Clustering

THOMAS M. KOULOPOULOS

When faced with the problem of *finding* relevant information in a mountain of on-line documents, it's never clear just how much relevancy is out there. The result is that users of text-retrieval systems must become experts at using query languages and at understanding the nature of the documents they are searching for.

Too Much or Too Little

Most users of on-line search-and-retrieval systems have neither the time nor the interest to become experts at Boolean logic. In fact, the majority of these users rarely include more than two or three terms in their queries. The result is that either too much or not enough information is retrieved. This problem is referred to as *precision and recall*. The objective is to optimize the balance of both of these factors and get exactly the information that you need.

Many document management systems place the burden of striking this balance and formulating the right query squarely on the shoulders of the user. Document clustering seeks to reduce this burden by automating the process of inferring relevancy.

Clustering is designed to help users retrieve the relevant documents without the aid of a thesaurus. The key objective of clustering is to respond to what the user's query did not say, could not say, but somehow made manifest.

Interpreting Intent

There are several methods of document clustering. In each one, interpreting the intent of a query is accomplished by inferring relevancy not just from a document's similarity to the user's query terms but also by the document's relevancy to general subject categories and other documents in the database. This is substantially different from traditional text-retrieval systems, which rank each document against the query alone.

Clustering is such an important development because of the peculiar nature of text queries, which involve the ambiguity, richness, and subtleties of language. Text queries constitute an inexact science. Consider, for example, the query FIND TEXT = AUTOMOBILE ACCIDENT, which is a request for all the documents that contain the phrase *automobile accident*. Will this find all the references to the accident, both direct and indirect? What if there is a memo in the textbase that refers to the automobile accident as an unfortunate incident? If the document was not retrieved, valuable information would be overlooked. An on-line thesaurus sometimes provides assistance, but it can often be ineffectual in the face of elusive and ambiguous language. The problem with any thesaurus is that relevancy is not always based on word associations; in many cases, relevancy involves conceptual similarities.

In a clustered document management system, the example of a document containing the phrase *unfortunate incident* is likely to be retrieved even if the user only asked for "automobile accident" (see the figure).

Mimicking Human Thought

Another advantage of document clustering is that it also seeks to capture the associative nature of human thought. Our minds work by association as well as logic. Because a document database deals with the expressions of human thought (i.e., language), it needs to take this phenomenon into account.

Document clustering attempts to mimic the human thought process by grouping together documents with related ideas, concepts, and terminology, even where these relationships are subtle and implicit. It recognizes that the strength and value of a document database lies in the interrelationships among its documents and among the

BYTE ACTION SUMMARY

There is no need to be burdened with archaic query languages and the rigidity and limitations of strict Boolean logic in your large textbase searches. Modern systems include features of subject association, similar to the way our own memory works.

your own desk, you're faced with an information system over which you have no control and that offers myriad possibilities only if you make the right guesses.

The problem is how to find documents when you don't know who wrote them, when they were written, or the keyword or phrase associated with the documents. The value of a textbase system depends on how easily you can find information when you have little to go on. If there is no way to access the information without a keyword or phrase, the textbase system is of little value.

Clearly, the solutions designed for a personal information system are inadequate for a large textbase system. The focus of the information shifts from a personal information system to issues of a more fundamental sort. Providing a system as easy to use as the individual system is a worthwhile design goal, but the searching mechanisms must be appropriate for large information systems.

Current Technologies

Most software-oriented text management systems are based on a variation of database management technology: one designed to provide access to formatted data. When this technology is applied to text management, the resulting systems are generally referred to as *keyword* systems.

Keyword applications are characterized by an indexing technique that creates a word list resembling the index of a textbook. At the basic level, a keyword implementation provides a totally automated

subjects discussed in those documents.

The unique aspect of clustering that establishes these document associations requires the incorporation of knowledge engineering—the method by which user knowledge is transferred to the retrieval process. The difficulties of implementing this approach, although not insurmountable, should be considered.

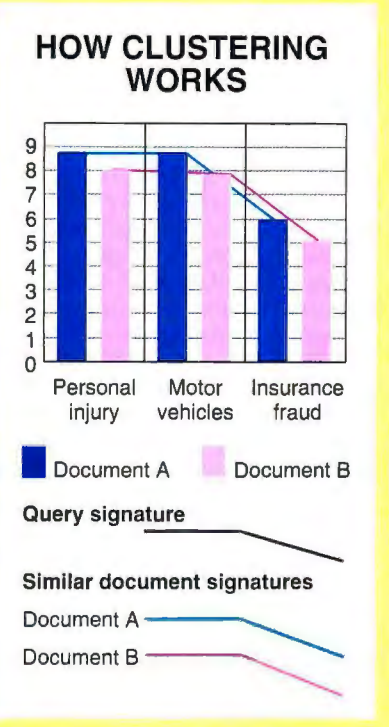
In some clustering systems, knowledge engineering is done by ranking several thousand words specific to the document collection against each subject category. Even though the process takes only a few days to accomplish, it requires someone familiar with the collection's subject matter. Ultimately, this type of clustering model is only as good as the expert that defines the subject categories and the knowledge base used to rank the documents.

There is also an approach to clustering in which the knowledge engineering is based on the co-occurrence of words, a sort of statistical clustering. For example, if you turn to the sports section of any newspaper during baseball season, you are likely to find a number of articles that make no mention of the term *baseball* but use other words or phrases that are associated with the sport (e.g., home run and stolen base). The statistics of word occurrences and their location provide enough information to generate clusters.

Learning by Example

Finally, clustering lets you use existing documents as examples for further queries. This query-by-example process is valuable to novice users who can identify what they are looking for when they find it but are not comfortable with a query language environment.

Thus, document clustering is designed to assist those who cannot always formulate a comprehensive query or who are not well versed in the nature of the on-line document collection. It offers a way to extract all the relevant information available in a database and avoid being buried under mountains of on-line data.



Document clustering ranks documents according to their relevancy to the query. For example, Document A refers to an injury resulting from an automobile accident. Terms within this document are ranked on a scale of 0 through 9 against the subject categories of personal injury, motor vehicles, and insurance fraud, with the values 9, 9, and 6, respectively. Document B, referring to "an unfortunate incident involving an ambulance," may contain terms that are ranked 8, 8, and 5 against these same subjects. As a result, these documents will have similar signatures by which they are clustered together. When you submit a query, it will also be assigned a signature that is ranked against document signatures to determine relevancy. Based on the clustering approach being used, the documents found to be relevant can be used to find other documents with similar signatures.

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solution (untouched by human hands) called *full-text* indexing and retrieval. As text is presented in an electronic format, the machine generates a list of strings associated with each document. All discrete strings in a document (except those identified as noise strings) are inverted: listed in a predetermined order, with the list associated with a document identification number.

The full-text method is a straightforward, easily implemented solution. The primary issue in full-text indexing is managing the overhead—the lists of alphabetized strings. Most large document management systems use the full-text approach. Because these lists equal and sometimes exceed the storage required for the original text, the solution becomes expensive.

On the retrieval side, queries are handled on the basis of a *string-match* principle: Each indexed string in a query is matched with a string in the text. Documents are retrieved if there is a match. All the systems described above operate on the premise that you know exactly what you are looking for and that the text exists in the form you are seeking. These are concepts inherited from a tradition of managing data that doesn't translate directly to managing text. The DBMS (database management system) technology was not designed to address free text, which, unlike formatted data, is unstructured, unformatted, and may be about a particular subject. To further complicate the text management problem, queries will be ad hoc and differ from individual to individual.

Commercial Solutions

To alleviate the problems caused by the poor fit of database technology to text management, various techniques have been incorporated into commercial software. These will be discussed later in the context of identifying the critical-performance characteristics of systems to manage large collections of documents effectively.

Hardware-intensive solutions share many of the limitations of keyword technology. The most prevalent hardware-oriented approach is based on what is termed *free-text scan*. In the simplest terms, the entire document base is scanned for each query. No overhead is generated because there is no index. As the document base grows, additional hardware is added to expedite the search process.

continued

Searching Through J-Space

ITMS (Intelligent Text Management System) from Information Access Systems (Boulder, CO) is a full-text classification-and-retrieval system that automates the input, classification, retrieval of unstructured documents, and storage. ITMS integrates three retrieval strategies: formatted field, keyword, and intelligent retrieval.

The intelligence of ITMS is provided by a knowledge base called a JBM (judgment base module). The JBM is developed through a human-judgment-simulation (judgment space, or *J-space*), the results of which are incorporated into the machine decision-making process. Subject fields and rated vocabulary make up a JBM.

Keyword and formatted-field queries are created with standard Boolean syntax. Intelligent-retrieval requests are typed in conversational language by requesting documents about or similar to a particular subject. ITMS presents you with the combined results of keyword, formatted-field, and intelligent searches in the order of their overall relevance to a query. Text retrieval is based on an understanding of the subject matter of the document base that ITMS is managing. Thus, it can select documents that are conceptually similar to the query and list them in order of similarity. ITMS also automatically classifies text and highlights relevant subdocuments for quick reference.

On the horizon is a software-oriented technology designed for text management. This technology is called *document clustering* (see the text box "Document Clustering" on page 272).

Selectivity

The list of comparison points for evaluating text management systems begins with *selectivity*. Selectivity pertains directly to the most frequently voiced user's lament: information overload—the impossibility of finding what you need in the gigabytes of data available, weeding out extraneous material. At issue is not only your "futility point" but also your time constraints. How much time will you spend looking—trying one path and then another—before you reach the futility point and abandon the search altogether? How much time is wasted? What are you willing to settle for when you can't find exactly what you are seeking? How much time and money do you typically expend?

Essentially, the issue is how well any system is able to screen out text that does not meet or exceed a usefulness threshold value: Is it delivering relevant information? This ability becomes critical as the document base expands.

Each commercial product is subject to the particular limitations of the technologies on which it's built, but all have been enhanced to overcome these limitations. Vendors of keyword-based systems, for instance, have added enhancements to every aspect of the techniques by which term lists are created, stored, and retrieved. Early products addressed the query definition requirement for Boolean operators: combining word x with word y (known as *ANDing*) and excluding "not word z." The assumption is that you can make a selection by specifying which words you wish to see in a retrieved document. Free-text scanning supports the Boolean retrieval method.

Unfortunately, what you specify in the "not" component of your Boolean search expression may well contain the information that you were trying to find with the "and" portion of the query. In spite of this limitation, the Boolean-request format remains a standard feature of most large-scale systems.

Other automated solutions (e.g., Fulcrum Technologies' Ful/Text) have an additive feature by which the frequency of a word enhances its retrieval. The assumption is that if a word is repeated it has more value. In the *unique-word* approach, a word is assumed to have greater retrieval power if it occurs the least amount of times in the text. And yet another variation of the fully automatic system is the *vector-space* approach, in which each document is represented by a vector of terms, each of which is represented by a positive number. To select documents for retrieval, the system performs similarity computations between the value of stored items and incoming queries. It ranks the retrieved items by how similar the word-count ratio is to that of the query. The vector-space approach is implemented on the Connection Machine (Thinking Machines, Cambridge, MA).

Thesaurus construction and manual (i.e., human) indexing provide an alternative to the full-text mode, although the underlying supporting technology in both modes is identical. With thesaurus construction and manual indexing, overhead is reduced because only the thesaurus terms are inverted. Another advantage is that the people creating the index can apply intelligent selectivity by anticipating and standardizing the terms you might use in a query. Further, the structure of a thesaurus helps you find alternative paths to explore to find a precise request.

The notion of adding human intelligence to facilitate the search is carried a step further by Verity (Mountain View, CA) in its product Topic. You add your own intelligence by assigning weights to relationships between query terms (single or multiple word) and topics when you formulate the query. Not all terms in the request have to be present for the document to be grabbed; it need contain only some of the terms in the topical hierarchy. Documents are selected on the basis of a relevance score, using the weights that you specify. Although constructing topic trees is straightforward for a small single-user database, the process doesn't lend itself to large shared systems.

The document-cluster idea is not Boolean query afterthought. Instead, it's designed for text management, and many of the questions regarding selectivity become irrelevant because its fundamental hypothesis is that closely associated documents are relevant to the same request. The basic design goal of this approach is to limit the number of documents retrieved in response to a query to those contained in a given cluster of like documents. The retrieved documents are ranked in query-relevance order.

Document-cluster systems and full-text systems are at opposite ends of the spectrum

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because the clustering capability requires human effort for development and maintenance. Although most clustering systems are in experimental stages, Information Access Systems (Boulder, CO) has developed a commercial product, ITMS (Intelligent Text Management System), out of its human-judgment-simulation technique (see the text box "Searching Through J-Space" on page 274).

Hardware-intensive solutions assume that selectivity is achieved through a character-by-character (or a surrogate) match of a text string in the query to one in the text—the longer the matched string, the more selectivity the system can achieve. A leading example of the character-by-character match is Gescan from Gescan International (Research Triangle, NC). Excalibur Technologies (Albuquerque, NM) uses a sophisticated representation schema for text and surrogate pattern matching. Documents containing similar information will be retrieved along with documents containing an exact match.

Precision/Recall Trade-off

What is the precision/recall trade-off? How much does the searching method cost the performance of the retrieval method? These are key questions. Traditionally, text management systems were evaluated by measuring how closely a delivery system was able to retrieve what the user was looking for (precision) and whether the system was able to get everything that was relevant to a user's request (recall).

In the fully automated implementations of keyword systems, the trade-off is inevitable: The more precise your query, the more likely it is that you will miss some relevant information because the list of terms used in the request does not appear in the text. After many trial-and-error passes, you may feel satisfied with the resulting document set and assume that all the documents pertaining to your subject matter have been found. Unfortunately, this is not usually the case; you have missed many documents because their authors didn't use the same keywords that you used when you described the subject of your query. The documents you're missing may contain the essential information you were seeking.

Techniques such as Boolean queries that use OR, fuzzy logic, associative searching, morphologies, neural networks, and *wild carding* are all methods of enhancing keyword-search technology to reduce the precision/recall trade-off. Each method has had some success in decreasing the chances of missing important documents, but they have reduced precision in the process.

Probabilistic pattern matching is a hardware-oriented method that retrieves text holding the term that most closely matches the character-string pattern of the query term. In document-clustering systems, the precision/recall trade-off is addressed through their basic design: Documents that cluster around the subject of the query are returned in order of "relatedness" on the basis of their conceptual distance from the query.

Subdocument Retrieval Capability

Subdocument retrieval is primarily aimed at reducing the time the user spends reading through text to find something useful. If the document-retrieval system can place you right in the most relevant part of the documents that you have selected, your time will be spent productively.

The critical question is whether the document management system is able to automatically subdivide a document into sections that reflect changes in the focus of the subject. A section that is relevant to your query may amount to only two paragraphs in a 400-page document.

What to Expect

The list of subjects for evaluating textbases can go on and on. Be sure that the systems you're evaluating can have high-level indexes capable of identifying more than one subject per document and that your system can retrieve all the information on a subject. This may sound simplistic, but it's the most important concern you should have when evaluating systems.

Textbases are accumulating at an accelerating rate, as data links and input devices proliferate. Increasingly, users of these shared systems are not trained librarians but executives and professionals who want direct access to text-based information.

Gigabyte-size document bases are literally bursting the seams of the hand-me-down trappings of their predecessor, the database. Text must be fitted with a technology suited to its nature if it's ever to take its place in the world and fulfill our expectations of its potential. ■

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Earlene Busch is the president of Information Access Systems (Boulder, CO). She writes and speaks frequently on knowledge management systems. You can reach her on BIX c/o "editors."

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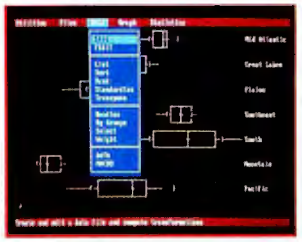
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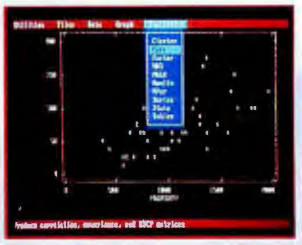
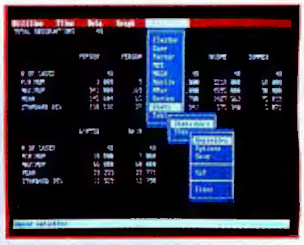
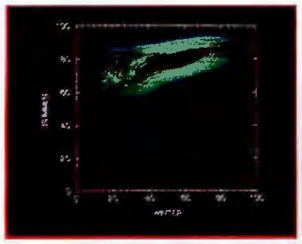
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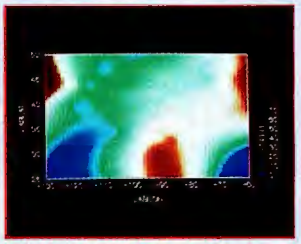
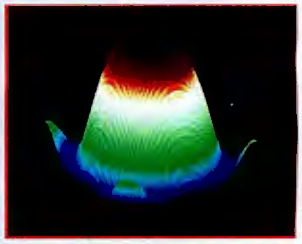
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SGML FREES INFORMATION

Escape a world where there is too much data and go to a place where you can access the information hidden within it

HAVILAND WRIGHT

In the 1980s, desktop publishing emerged as a way for computers to manipulate the *look* of a document. After a decade of widespread adoption of these tools, however, the *information* in documents is largely inaccessible by computer. The challenge of the 1990s is to transform documents into information that has an impact on productivity and innovation.

The word *document* once conjured up images of large, legal-looking sheaves of paper that were guaranteed to gather dust. Now, it's a general term that covers faxes, E-mail, user's manuals, journal articles, and bulletin-board notes. In addition, there are analogies between documents and business presentations, interactive computer sessions, hyperlinked multimedia collections, and musical performances. Each of these new forms of documents shares a common thread—the use of organizing themes—that can trace its ancestry to the original concept of what a document is.

It's one thing to see commonalities between forms of documents and quite another to make use of them. The rise of the SGML (Standard Generalized Markup Language) has corresponded to and contributed to the evolution of the concept of a document from a physical reality to a processing metaphor for many different information-bearing forms. As a language for expressing context-free document descriptions, SGML offers a way to productively put to use the similarities among these various expressions.

SGML is best known for its use in large-scale standardization efforts, such as the Department of Defense's CALS (Computer-Aided Acquisition and Logistics Support) program and the ongoing work of

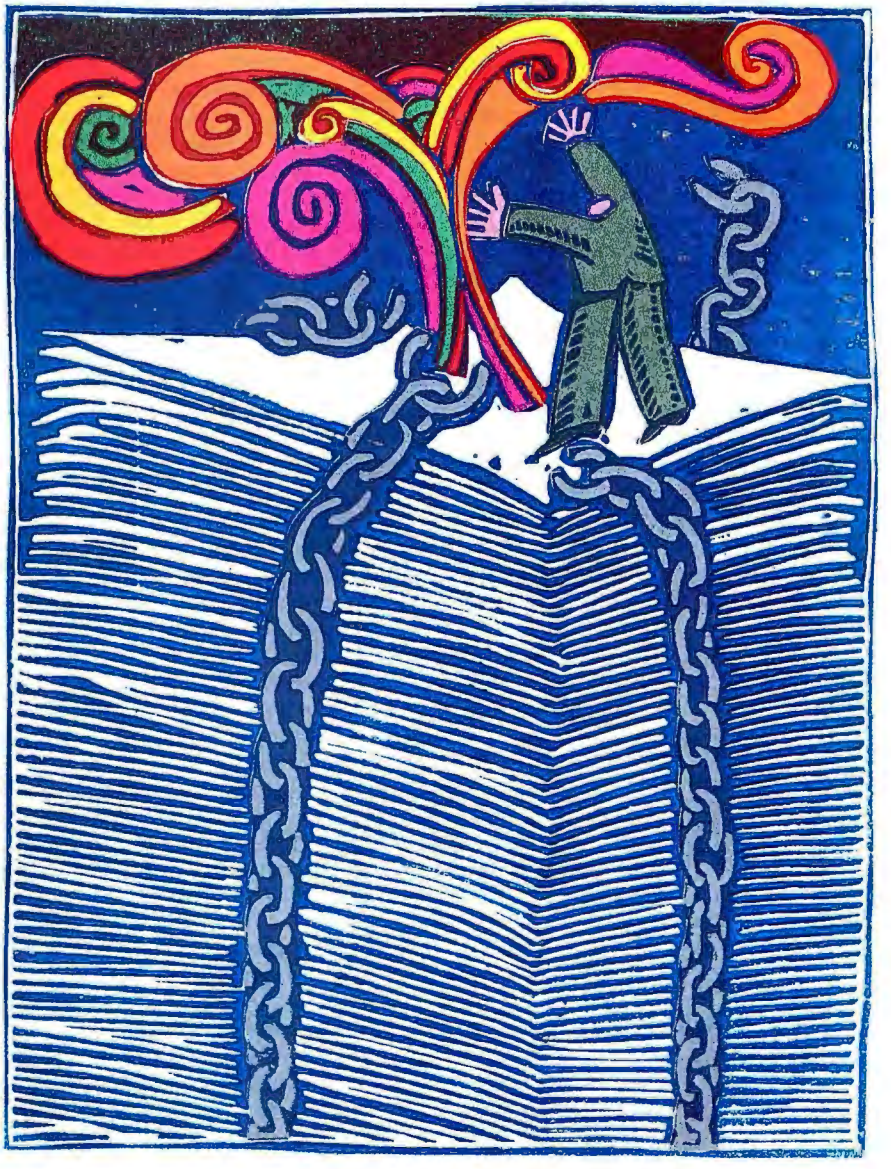


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the Air Transport Association and the Telecommunications Industry Forum. It's important to realize, however, that other SGML-based systems are also in operation today.

Developers and systems integrators who manage large volumes of documents and exchange information among various hardware platforms and software packages use SGML to encode document information. Those who ignore SGML often must reinvent its key features to achieve their objectives. SGML applications can provide the necessary structure for exchanges that support communities of mutual interest, even when they involve many participants and several human languages.

SGML works because it's simple. Like any other language, it requires detailed knowledge for systems implementation. But you must know only a few basics to use SGML or to understand its implications.

Why Use Markup?

In the world of paper documents, *markup* refers to the way an editor, colored pencil in hand, annotates manuscripts with typographic specifications and other presentation notes. In electronic-document files, markup usually appears as tags, or codes, interspersed with the text and other material in a document. Electronic-publishing systems, full-text databases, hypertext and hypermedia systems, and other document-oriented applications require files that contain both content and markup.

Markup separates a document's logical elements and may specify what functions are to be performed on them. A markup tag for a paragraph, for example, might indicate where the paragraph begins, whether or not to indent the first line, and what typeface to print it in. Markup provides the structure and procedural information that you need to print and manipulate documents.

Taken as a whole, an application's tagging vocabulary expresses its functional capabilities. You don't need tags for table rows, columns, and cells, for example, if your word processor can only set tables with tabs.

Historically, markup has been product-specific, and its languages have been as varied as the products they have supported. Few popular products give you access to explicit markup. Word processors buffer you from it with WYSIWYG interfaces. Products that support explicit code editing often transform those codes into other forms of markup as they produce document files. Still other products obscure the code with complex file structures. And there are both ASCII and non-ASCII markups.

These issues aside, you can generally classify markup languages as either *procedural* or *descriptive*. The tagging vocabulary of a procedural markup language expresses the actions you must perform on a document's content to achieve the desired appearance. The procedural markup in figure 1 provides a detailed, top-to-bottom script, often repeating the same sequences.

On the other hand, descriptive markup tags identify logical units of text. By itself, descriptive markup doesn't address how a document looks. In figure 1, however, there is an obvious mapping from the descriptive markup in the left margin to the procedural detail in the right margin. This mapping is the essence of a *style sheet*, which uses descriptive names for detailed procedural scripts.

Although they simplify document markup, style sheets don't necessarily contain much information about the document itself. They generally address document components one at a time, leaving the overall document structure implicit. More important, style sheets rarely contain descriptors that suggest how you can use the information in a document. To free the information in figure 1 from the page, you need new descriptions: an expanded descriptive tagging vocabulary.

Flexibility Is the Key

SGML is a programming language designed to write tagging systems. Because most SGML programs are compatible with a variety of applications, SGML markup is almost always descriptive. An SGML application program called a DTD (document type definition) defines *classes* of documents. Each document *instance* in a DTD class is tagged as a hierarchy of nested elements.

Although you can control how the tags look in SGML markup, the default is to use angle brackets as tag delimiters, so angle-bracketed tags are strongly associated with SGML. More important, however, is your ability to choose the names for element tags and document structures. In figure 2, for example, the element tagged CHAPTER CHAPNUM="NINETEEN" CTITLE="VINCENT SERVICING" consists of a paragraph and two sections. Each of these constituent elements is composed of text and/or other elements.

Figure 2 shows an SGML application that tags the surface structure of the page shown in figure 1. The document's visual appearance implies its nested structure, and the style-sheet component names reinforce that structure. Although style sheets treat documents as sequences of text blocks in a flat-document approach, SGML-tagged documents are explicit, related hierarchies of named objects.

The tags in figure 2 mark the document structure, and some of them contain additional information about the elements they delimit. The CHAPTER and SECTION tags, for example, contain titles and numbers. The LABITEM tags contain labels. These additional information items are known as SGML *attributes*.

The DTD defines attributes as information items related to specific elements. An attribute definition names each information item to be associated with an element and assigns it a data type. In the DTD for figure 2, for example, the attribute name for LABITEM is LABEL, and the type is character data. When tagging an element, you include the attribute names and values in the tag itself.

DTDs that define the surface structure of a class of documents can support an array of presentations, applications, and translations. In figure 2, the tags alone contain enough information to build a detailed table of contents. Translating the document for outline processing requires exactly the same information encoded in the document hierarchy. If tag assignments to typographic styles are made in a context-dependent manner, paper publishing becomes quite flexible.

As an applications language, SGML has powerful facilities for coordinating various documentary material. DTDs can include provisions for graphics files, PostScript printing, or special processing codes for mathematics. Applications can also include character sets to support virtually any national language or special typography.

BYTE ACTION SUMMARY

Today, a document may have a longer life than anticipated, occur in a variety of forms and pieces, and interact with systems that didn't even exist when it was created. For important documents, it's not adequate simply to view and print them. SGML gives you a flexible way to access the information hidden within those documents.

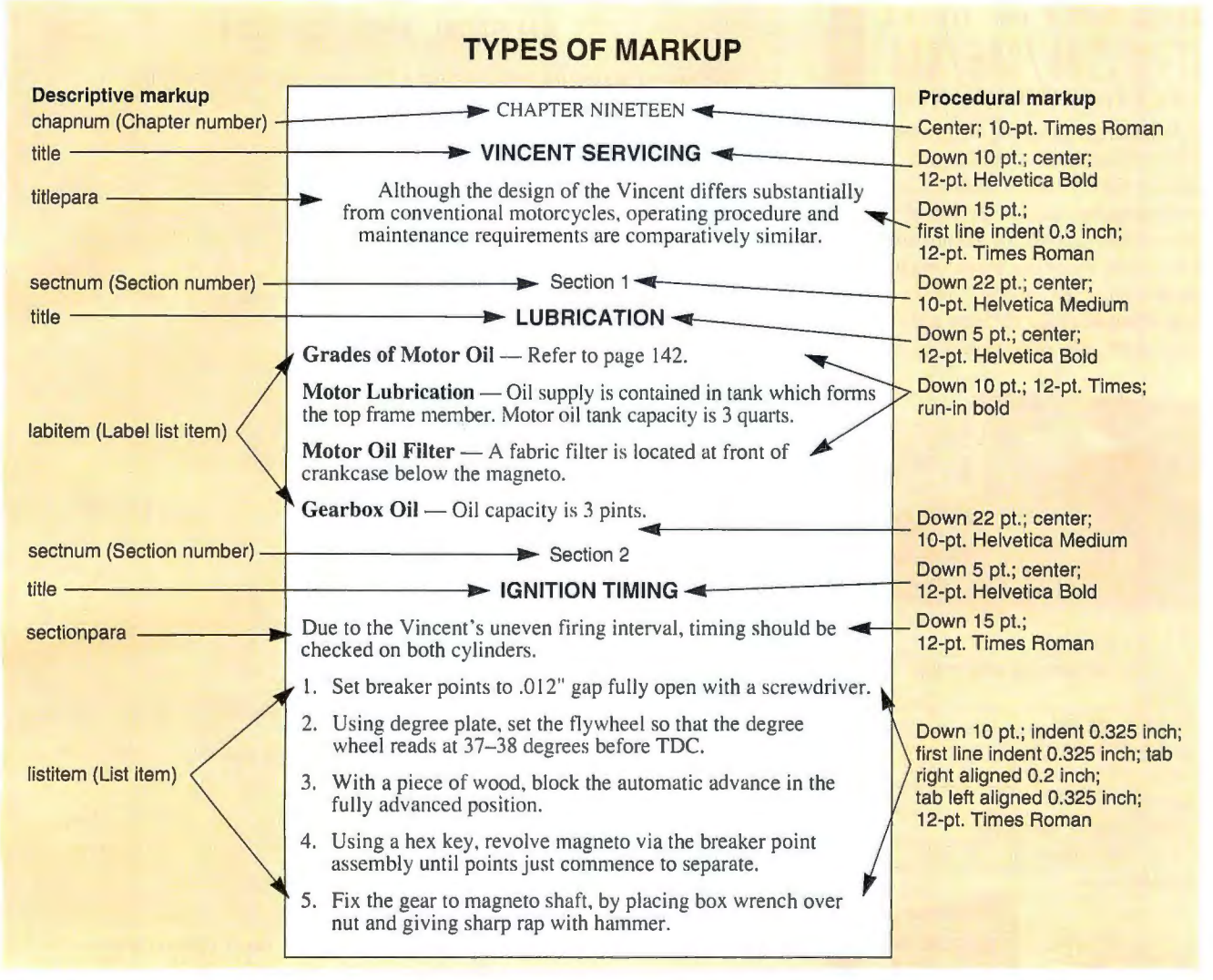


Figure 1: *This page is marked up with simplified versions of both procedural and descriptive markup languages. Note the mapping between the two languages; it forms the essence of a style sheet. The text appearing on the page was taken from* Modern Motorcycle Mechanics *(Nicholson Brothers Motorcycles, Ltd., 1974).*

You can use SGML applications to coordinate collections of documents by structuring references to external files. In addition, you can tag document instances with sections to be conditionally included or ignored. As a process-independent language, SGML lets you validate any document instance before beginning potentially costly subsequent processing.

The advantage of SGML applications is their flexibility, even when they encode only the surface characteristics of documents. In the age of computers, a document can have a longer life than anticipated, have various appearances, be excerpted for many reasons, and interact with systems that didn't even exist when it was created. For documents of value, it will never be adequate simply to view and print them. The more flexible your document-handling systems are, the more value you can derive from the documents you produce.

Turning on the Power

Applications exploit the power of SGML when they define documents as *information resources*. As such, DTDs often describe document classes in which document instances are similar in information content. Figure 3 retags the page that appears in figure 1. Although the document's surface structure is still apparent, the tagging now emphasizes information content.

The tagging in figure 2 addresses the *physical* document structure. The tagging in figure 3 deals with the *logical* information structure, and its DTD assumes that this is one of many service chapters that contain similar information about other motorcycles. Each chapter contains lubrication information and procedures for ignition timing. You can still create a printed version of the chapter, but the new method of tagging enhances your ability to do other, more interesting things with this information.

Attributes now express much of the information that the text previously conveyed. The tags in the first section of figure 3 relate the page's purpose: to provide lubrication information. The first item explicitly tags the cross-reference as CROSSREF with an attribute named TARGET, which is set equal to page 142. Tank capacities have CAPACITY tags with attributes that note the appropriate type of capacity units. The second section tags the cautionary lead paragraph as a NOTE. Each step contains tagged key values and tools.

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AN SGML APPLICATION

```
<CHAPTER CHAPNUM="NINETEEN" CTITLE="VINCENT SERVICING">
<PARA>
   Although the design of the Vincent differs substantially from conventional motorcycles, operating procedure and maintenance requirements are comparatively similar.

<SECTION SECTNUM="1" STITLE="LUBRICATION">
<LABLIST>
<LABITEM LABEL="Grades of Motor Oil">
   Refer to page 142.
<LABITEM LABEL="Motor Lubrication">
   Oil supply is contained in tank which forms the top frame member. Motor oil tank capacity is 3 quarts.
<LABITEM LABEL="Motor Oil Filter">
   A fabric filter is located at front of crankcase below the magneto.
<LABITEM LABEL="Gearbox Oil ">
   Oil capacity is 3 pints.
</LABLIST>

<SECTION SECTNUM="2" STITLE="IGNITION TIMING">
<PARA>
   Due to the Vincent's uneven firing interval, timing should be checked on both cylinders.
<SEQLIST>
<LISTITEM>
   Set breaker points to .012" gap fully open with a screwdriver.
<LISTITEM>
   Using degree plate, set the flywheel so that the degree wheel reads at 37–38 degrees before TDC.
<LISTITEM>
   With a piece of wood, block the automatic advance in the fully advanced position.
<LISTITEM>
   Using a hex key, revolve magneto via the breaker point assembly until points just commence to separate.
<LISTITEM>
   Fix the gear to magneto shaft, by placing box wrench over nut and giving sharp rap with hammer.
</SEQLIST>
</CHAPTER>
```

Figure 2: *This SGML application tags the surface structure of the page shown in figure 1. Note how the tags mark the document's physical nested structure and how the element names reinforce it.*

The tagging has made the document an information resource: You need a screwdriver, degree plate, hex key, box wrench, and hammer to adjust the ignition timing. You need 3 quarts of oil to change the oil. And the Vincent's oil tank is on the top frame member.

SGML supports a broad range of document types, including some that might not at first appear to be documents. For example, if a document is published as part of an on-line database (in addition to being published as a book), it could include element tags for user comments and questions, just as the DTD includes tags for tools and key values. Database users might not appreciate, or even see, the SGML tagging used for implementation, but they might want to make notes (e.g., USERNOTE I'd be careful giving a 30-year-old bike a "sharp rap" with a hammer. Please advise on torque value. /USERNOTE).

Putting SGML to Work

SGML systems are open. You can implement them in incremental stages. They can work with existing environments and with other commercial software packages. Although SGML-compliant products meet a broad range of functional requirements, most systems include components for creating, editing, converting, composing, and rendering documents.

SGML systems often contain several editing tools. For document authoring, you can use style-sheet-driven word processors for SGML editing by augmenting style-sheet encoding with a utility to check for their consistent use. These tools guide the use of style-sheet components to enable direct conversions from word processor files to SGML applications.

Alternatively, some editors provide explicit SGML support. Of these, some display tags and attributes and require you

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THE DIFFERENCE A TAG MAKES

```
CHAPTER [BIKETYPE="Vincent"]
INTRO Although the design of the Vincent differs substantially from conventional motorcycles,
  operating procedure and maintenance requirements are comparatively similar. /INTRO

LUBE
  SUPPLIES
  ITEM Grades of Motor Oil /ITEM
       DETAIL CROSSREF [TARGET="PG142"] /CROSSREF /DETAIL
  ITEM Motor Lubrication /ITEM
       DETAIL Oil supply is contained in tank which forms the
       LOCATION top frame member. /LOCATION Motor oil tank capacity is
       CAPACITY [UNITS="QUARTS"] 3. /CAPACITY /DETAIL
  ITEM Motor Oil Filter /ITEM
       DETAIL A fabric filter is located at
       LOCATION front of crankcase below the magneto. /LOCATION /DETAIL
  ITEM Gearbox Oil /ITEM
       DETAIL Oil capacity is
       CAPACITY [UNITS="PINTS"] 3. /CAPACITY /DETAIL
  /SUPPLIES
  /LUBE

TIMING
NOTE Due to the Vincent's uneven firing interval, timing should be checked
 on both cylinders. NOTE

METHOD
STEP [ ] PARA Set breaker points to POINTGAP [UNITS="INCHES"] .012 /POINTGAP fully open with a
         TOOL screwdriver. /TOOL /PARA /STEP
STEP [ ] PARA Using TOOL degree plate, /TOOL set the flywheel so that the degree wheel reads at
         KEYVALUE [UNITS="DEGREES"] 37–38 /KEYVALUE before TDC. /PARA /STEP
STEP [ ] PARA With a piece of wood, block the automatic advance in the fully advanced position.
         /PARA /STEP
STEP [ ] PARA Using a TOOL hex key, /TOOL revolve magneto via the breaker point assembly
         until points just commence to separate. /PARA /STEP
STEP [ ] PARA Fix the gear to magneto shaft, by placing TOOL box wrench /TOOL over nut
         and giving sharp rap with TOOL hammer. /TOOL /PARA /STEP

  /METHOD
  /TIMING

  /CHAPTER
```

Figure 3: *Putting a different set of tags on the page in figure 1 changes things. Although the document's surface structure is still apparent, the tagging now emphasizes the document's logical information content.*

to have extensive technical knowledge of SGML. Others offer you a choice between a nearly WYSIWYG interface and explicit tag editing. SGML-specific editors provide a powerful way to check documents for conformance to the document style and to edit the details of a tagged-document instance.

An SGML system should include an SGML parser or an SGML-specific editor that can check documents for DTD compliance. I used one such author/editor from SoftQuad (Toronto, Ontario, Canada), for all the SGML examples in this article.

Most new system implementations include a conversion stage. An SGML system is no different than the new systems and usually requires two kinds of conversions: back-file conversion for existing documents and new-file conversion for ongoing document interchange with external sources. An important difference between the two is that back-file conversions are very often concentrated, highly visible efforts, and new-file conversions are widely dispersed and often go unnoticed.

SGML conversion is rarely a matter of code-for-code translation. The markup in source documents is often not detailed enough to support a straight translation into an SGML application. This means you must determine SGML tags that have no source-file equivalents in much the same way that you infer the structure of the document in figure 1 from its visual appearance. In fact, this is exactly how Fasttag from Avalanche Development (Boulder, CO) determines document structure.

A growing number of software packages support SGML and don't require translation of SGML document instances before you run them. Usually, however,

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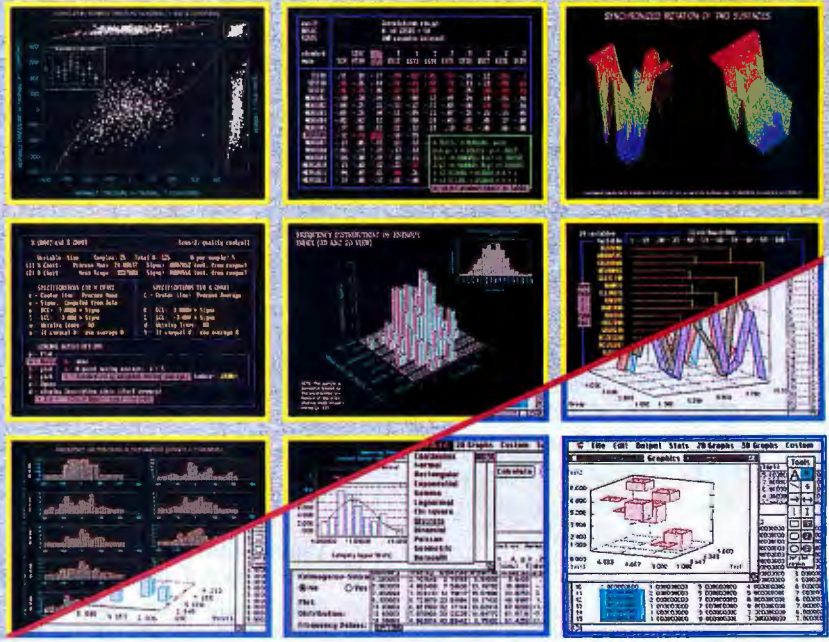
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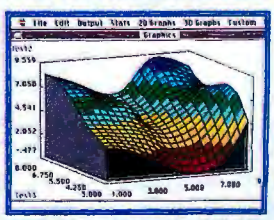
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they require a setup to attach the appropriate processing methods to the elements defined in the DTD.

To process SGML document instances with a non-SGML process, you must translate the document-instance tagging into the markup that the non-SGML process supports. Systems like Avalanche's SGML Hammer create markup for target systems on the basis of the SGML DTD and a translation program.

Popular Misconceptions

Misunderstandings about SGML are widespread. To some extent, this is the fault of the SGML community. Even though SGML, like other languages, involves a lot of detail, the SGML glitterati are absorbed in the use of this detail as intellectual flak against the uninitiated.

Here are a few guidelines to help you avoid some of the most common misconceptions about SGML.

- Don't confuse an SGML application with SGML itself. In an SGML application, you create the tag names. They aren't part of the SGML specification. Broad applications (e.g., the Association of American Publishers and the CALS applications) are sometimes presented as though they were SGML itself.
- Be cautious of document systems that are described as being "SGML-like." Non-SGML systems may have markup with angle-bracket tag delimiters, use header files, and utilize a concept of document structure, but none of these things by themselves make an application SGML-compliant.
- SGML is not just a document-interchange language. Although SGML is a logical choice for writing document-interchange applications, it's more than an interchange language.
- Adopting SGML doesn't mean that your documents will automatically be compatible with any other SGML system. Another SGML system should be able to read your document instances, but it won't be set up for your DTDs.

Work Smarter

Work in SGML is ongoing. Much progress has been made on a standard SGML application called HyTime for Hypermedia. The Electronic Publishing Special Interest Group has begun to refine its SGML application for markup of complex mathematics and tables. And the International Organization for Standardization (Geneva, Switzerland), a worldwide federation of national standards bodies, has issued a draft international standard for the DSSSL (Document Style, Semantics, and Specification Language) that provides a standard architecture for formatting specifications.

The fundamental message of SGML is that your documents can stop being overhead and start contributing to productivity and innovation. The paper-document trap isn't a file cabinet filled with stuff no one will ever read, and it isn't the cost of printing and shipping documentation that is 90 percent redundant with telephone support. Paper documents (and their electronic equivalents) trap and smother the information, know-how, feedback, product ideas, and market intelligence that can help your department, company, or agency work better and work smarter. SGML is one of the tools that can help free that information. ■

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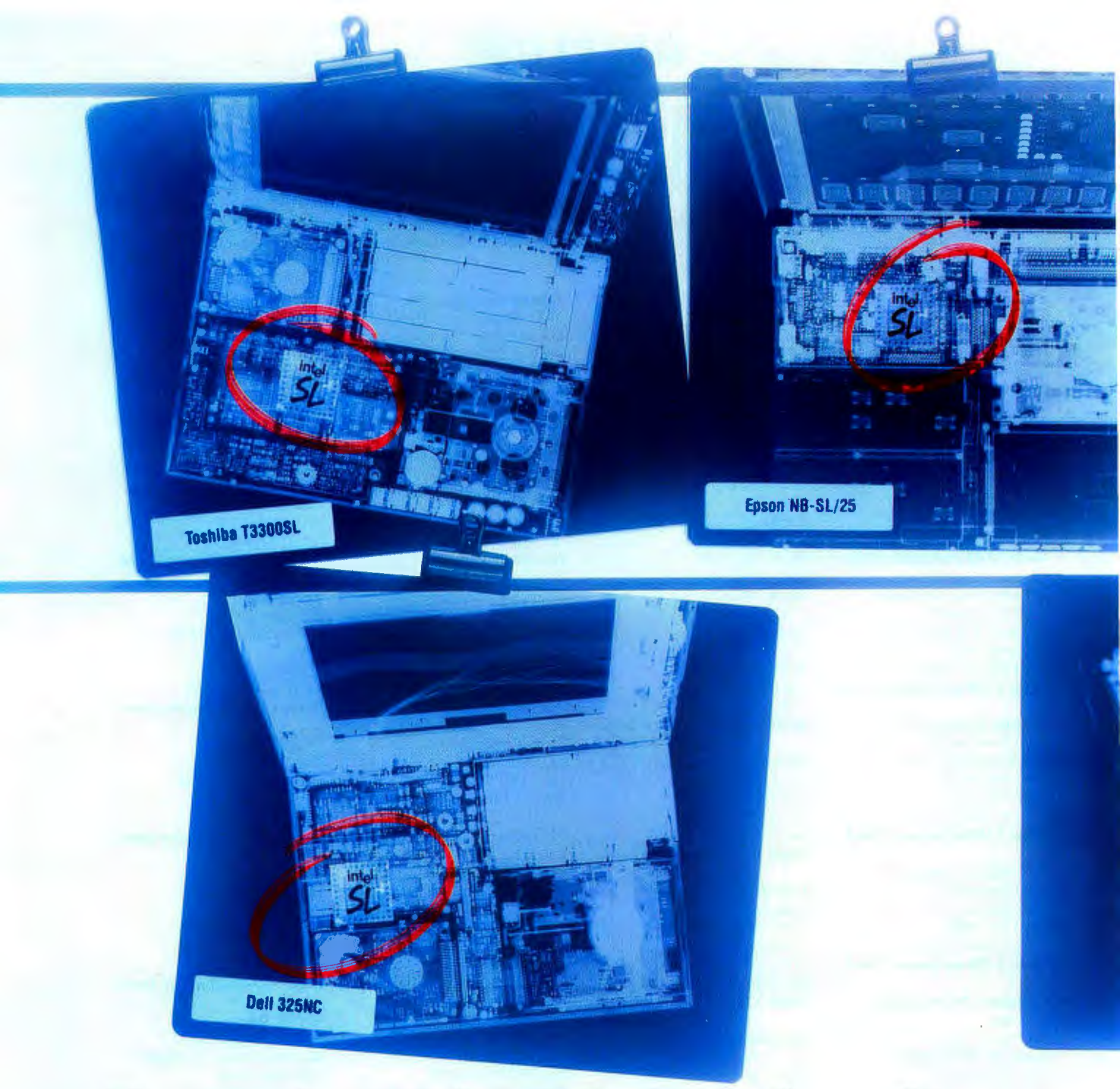
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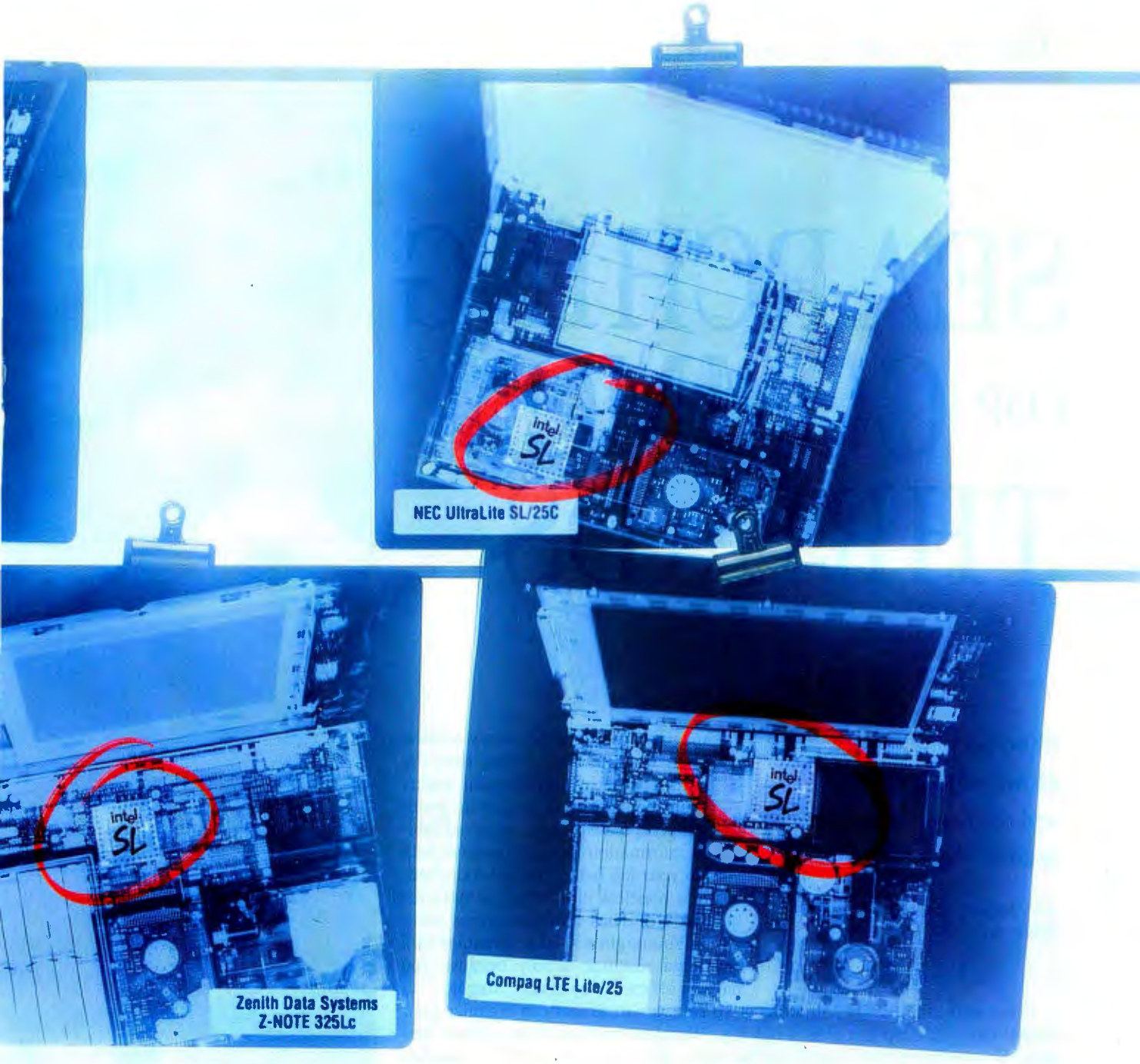
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SEARCHING FOR COMMON THREADS



Good text managers do more than search and retrieve—they bring organization to chaos

RAYMOND GA CÔTÉ
AND STANFORD DIEHL

Imagine opening a dictionary to look up a word and realizing that the entries were in no particular order. Many companies face a similar problem with corporate data. A wealth of electronic information may be there to help you do your job better, but all too often, it's in a hopeless jumble spread out over hundreds of files and directories on a LAN. You might not take advantage of a rich data resource simply because you have no efficient way of accessing it.

This month, the BYTE Lab looks at 10 software tools that can organize your textual data and help you find it quickly. We tested askSam from askSam Systems, Concordance from Dataflight Software, Folio Views from Folio, ideaList from Blackwell Scientific Publications, Isys from Odyssey Development, Magellan from Lotus Development, On Location from On Technology, re:Search from MicroRetrieval, Sonar Professional for Windows from Virginia Systems Software Services, and ZyIndex for Windows from ZyLab. All these programs organize large amounts of textual data and deliver a mechanism for finding the information you need. For stand-alone computers and especially for networked systems, these tools can be indispensable. With them, you can impose order on chaos.

The Three Approaches

There are three basic strategies for taking control of textual data. Isys, Magellan, On Location, Sonar, and ZyIndex are *file-indexing* packages. They build a search index of selected files, leaving original files in place and storing only pointers to these files in the index. These applications extract information from files that are widely spread over a network or a hard drive. They are most useful when extracting information from relatively disorganized files that may change frequently, such as the day-to-day memos, letters, and reports on a typical hard drive.

Folio Views and re:Search draw entire files into one organized structure for archival storage or for distribution; we'll call this class of packages *text libraries*.

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BYTE ACTION SUMMARY

- **WHAT TEXT MANAGEMENT PACKAGES DO**
  Working in several different ways, these 10 packages organize text files by content, allowing rapid retrieval of information.
- **LIKES**
  The best packages offer extremely powerful search and retrieval features. Folio Views and Sonar Professional are outstanding in this regard. Isys and ZyIndex combine solid search capability with an easily mastered interface.
- **DISLIKES**
  Text libraries and free-form databases are difficult to learn and use. Indexes often require a vast amount of space; in particular, Sonar Professional's index can be larger than the text it represents.
- **RECOMMENDATIONS**
  For managing dynamic, rapidly changing data, Isys and ZyIndex are both excellent solutions. Folio Views is the best at handling more static, archival information. Finally, askSam is a great general-purpose organizational tool.

Text libraries are best suited for extracting information from fairly static data files. Since your data has ceased to move around, these programs provide a much higher level of control of the information presentation. These products also provide inexpensive reader programs that you can distribute with your data—in short, they can help to publish your information.

With text libraries, you can view your data much as you might view a hard-copy book. With an outline view, you can move to a section that interests you or browse through the data a section at a time. Similar topics and subjects can be grouped together and filed under an organizational heading. Although these applications can accept free-form data, they are most useful when text is fairly well structured. These booklike interfaces can automatically provide indexes and tables of contents.

Finally, askSam, Concordance, and ideaList are examples of *free-form database managers*, hybrids between traditional database managers and text libraries. Free-form databases let you gather disparate data into a single structure. You have a great deal of freedom over the

TEXT MANAGEMENT PACKAGES: FEATURES SUMMARY

Although three classes of text management tools are represented here, similar search and indexing capabilities make each type of text manager suitable to a variety of tasks. (● = yes; ○ = no.)

	FILE-INDEXING PACKAGES					TEXT LIBRARIES	
	Isys 2.0	**Magellan 2.0**	**On Location 2.0**	**Sonar Professional 1.0**	**ZyIndex 4.02**	**Folio Views 2.1**	**re:Search 2.12**
Operating-system support[1]	DOS	DOS	Mac	Windows, Mac	Windows, DOS, Unix	DOS	DOS
Price[2]	$395	$99	$130	$795	$395	$695	$795
Searching							
User-defined concept searches	○	●	○	●	●	○	○
Nested (progressive) searches	●	○	○	●	●	●	●
Fuzzy searches (word roots)	●	●	●	●	●	○	●
Field or block searches	○	○	○	●	●	●	●
Vocabulary list (browse index)	○	○	○	○	●	●	○
Phonetic searches	○	○	○	●	○	○	○
Thesaurus or synonym searching	●	○	○	●	●	○	○
Search multiple databases or indexes	○	○	●	●	○	●	○
Save query	●	●	●	●	●	●	●
Search result sorting	●	●	●	●	●	○	●
Proximity searching							
Within number of words	●	○	○	●	●	●	●
Within sentence	○	○	○	○	●	○	○
Within paragraph	●	○	○	○	●	○	○
Order-dependent	●	○	○	●	●	○	○
Links							
Interdocument links	○	○	○	○	○	●	○
Search on selected word in document	●	●	●	●	●	●	●
Bookmarks	○	○	○	○	○	●	○
Attach notes to text	○	○	○	●	○	●	●
Generate table of contents based on text	○	○	○	●	○	●	○
Indexing							
Configure character properties	●	○	○	●	●	○	●
User-selectable "noise word" list	●	○	○	●	●	○	●
Background indexing	○	○	●	●	●	●	○
Separate search and index modules	●	○	○	●	●	●	●
Format support[3]							
Word processor formats	28	24	30+[4]	5	11	42[5]	2
Graphics formats	External viewer	DRW, Lotus Pick	None	Windows Metafile	TIFF, PCX, EPS, Windows BMP	PCX or External	TIFF, PCX
Other	dBase III memos	dBase, Excel, 1-2-3, ARC, ZIP	None	None	None	None	None
Editing tools							
Built-in editor	○	○	○	○	○	●	○
Run user editor	○	○	○	○	○	○	○
Run word processor based on document type	●	●	●	○	●	○	○
Documentation							
On-line help	●	●	○	○	●	●	●
Security							
Password protection	○	○	○	○	○	●	●
Access privileges	○	○	○	○	○	●	●

[1] Tested platform listed first.
[2] Price is for single-user version.
[3] Every package can also read ASCII text documents.
[4] Supports Claris XTND.
[5] These are filters supplied with the package. Folio Views operates on ASCII documents.

structure and presentation of the data. You can pull in unformatted text files or gather data into fields just as you would with a traditional database. A single database can contain both structured and unstructured data.

The free-form databases are not suited for managing files on a network, but they can provide a dynamic pool of shared data. For instance, you could add daily releases from a news wire to a free-form database and make the information available to everyone on a network. The information does not need to have the same kind of organizational and thematic relationships that are expected by a text library.

Naturally, the lines among the three categories blur when it comes to specific applications and installations. Although each of these products is most suited to a particular solution, all can be used to solve other problems. For example, although indexing programs are best suited for maintaining widespread, frequently changing data files, there is nothing to stop you from using them to extract in-

FREE-FORM DATABASE MANAGERS

askSam 5.01	Concordance 5.10	ideaList
DOS	DOS, OS/2	DOS
$395	$995	$225
○	○	○
●	●	●
○	●	○
●	●	●
○	●	●
○	○	●
○	○	●
●	○	○
○	●	●
○	●	●
●	○	●
●	○	○
●	●	○
●	●	○
●	○	●
●	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	●	●
○	○	○
○	●	●
ASCII only None	ASCII only None	ASCII only None
dBase, delimited ASCII	None	dBase delimited ASCII
●	●	●
○	○	●
○	○	○
●	●	●
●	○	●
●	○	○

formation from well-structured, static data files.

Text data can rapidly get out of hand when it is dispersed over a LAN. All these programs manage data on a network, but, once again, the approaches vary. In the case of text indexers, you could index all available files, treating network drives just as you would local drives. The index itself would reside on your local disk. You would then have a personal tool for accessing all the data available to your computer. You could follow the same basic approach for the free-form databases, drawing data from the network into a local database. Fortunately, all three of the free-form database packages we reviewed are available in network versions to enable simultaneous access across a network.

Text libraries should also reside on a network resource, where they can be read by all network users. However, because of the preparation and organization work involved, text libraries are not very efficient as personal management tools.

Testing Text Retrievers

We tested these text management packages by building search indexes on something near and dear to our hearts, one year's worth of text from BYTE magazine. One year of BYTE includes about 10.8 MB of text in 664 files. In our test directory structure, there was a single starting directory with 13 subdirectories, one for each issue; each subdirectory included a single file for each article.

For the packages we tested on the PC, we kept this source directory on our NetWare 3.11 server, a Compaq Systempro. Then we timed a variety of indexing operations from a Compaq 486/50L workstation on the network. We stored the index on the local disk to discount any network processing overhead. We timed the Mac packages on a Quadra 900, in a single-user coniguration.

Figure 1 on page 294 shows the results of our tests on indexing packages. We tested three operations, noting both the time each operation took and the size of the resulting search index. Our first test was the construction of a full index, starting with the files in the test directory. Next, we timed an incremental index after changing a single word. Finally, we timed adding an entire file from the index.

Of course, different types of text management packages required different test procedures. When timing text libraries and free-form database managers, we made a few adjustments (see figure 2 on page 294). For these packages, the original index-building time is actually the time it took to build an entire database—index, data file, and all. We also had to take into account the total size of the text database and its index, not simply the index alone, since some of the packages compress the original data. Index updates are actually updates to the database itself, modifying, adding, or removing files as the test requires.

We have not included askSam in the benchmark results because the package does not generate a full text index. With askSam, you are able to index only on specific data fields; otherwise, the entire text is scanned for a search term. In addition, the results for re:Search are somewhat misleading. Since the package creates an index but does not compile the text into a central file, the building time is much faster for re:Search than it is for the packages that have to move files around.

While you can't directly compare timings between the file-indexing packages and the programs that use a central database model, there is some correspondence between the results on each test. For example, whether building just an index or an entire text database, the first test result reflects the initial time investment you can expect to make when moving to a text management package.

Flexible Searches

Each of these packages ultimately allows you to scan groups of documents for words or phrases. We've summarized search and index capabilities in the table at left.

The simplest and most universally available capability is called Boolean searching. With this search method, you enter terms or groups of terms linked by simple Boolean operators (usually, AND, OR, and NOT), and the search engine returns a set of documents that contain words that match your search criteria. By combining Boolean operators, you can construct fairly sophisticated search criteria like "(Robert and Jordan)

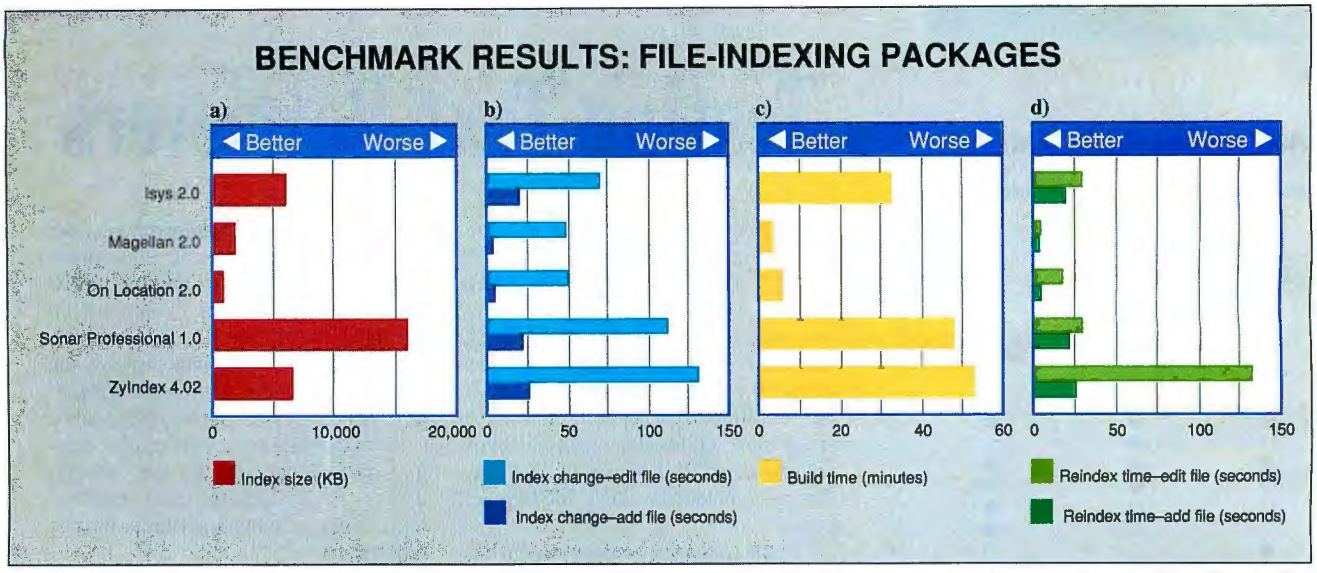


Figure 1: *Benchmark results for file-indexing packages:* **(a)** *shows relative sizes of the index generated by each package, while* **(b)** *shows the change in index size when modifying and adding a file;* **(c)** *and* **(d)** *show corresponding times for each operation. In all cases, shorter bars are better. Magellan and On Location were very quick, but these offer limited search features; of the more full-featured packages, Isys was the fastest and most efficient.*

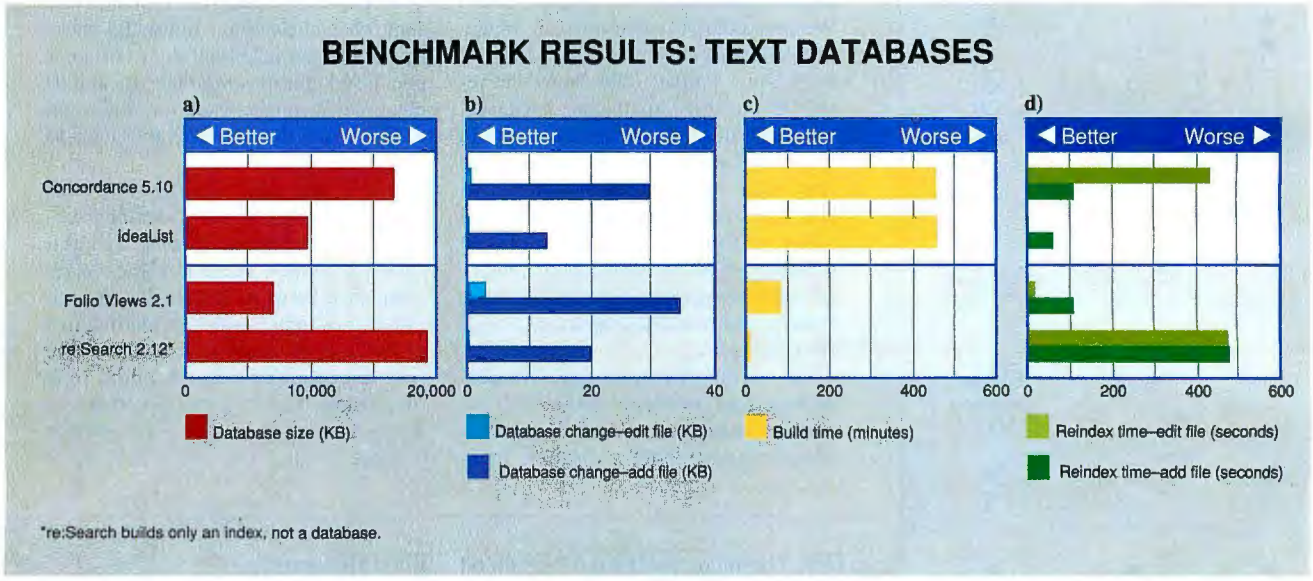


Figure 2: *Benchmarks for text libraries (bottom two) and free-form database managers (top two) are similar to those we used for file-indexing packages, but these text management packages build and modify entire databases, not just indexes.* **(a)** *and* **(b)** *show database sizes and changes in database size when modifying entries, while* **(c)** *and* **(d)** *track the times required to conduct these operations. Again, shorter bars indicate better performance.*

or Frederick Douglass not Robert Jordan."

Proximity searches add a level of flexibility. Proximity searching lets you find terms that are associated by their positions within the document. Most packages determine proximity by number of words, but some allow you to specify sentence, paragraph, and page limits.

The terms *wild cards*, *conflation*, and *fuzzy searches* are all used to describe the mechanisms for finding words that are near matches for the search term you've entered. These techniques must be used cautiously because they have the ability to find words in a large number of documents—often too many to be useful.

Wild-card searches assign special meaning to wild-card symbols (usually, ? to match any single character and * to match groups of characters). With a wild-card search, searching for *post?* finds *posts* and *poste;* searching for *post** finds the same two, plus *post*, *poster*, *postage*, *postal*, *postwar*, *postscript*, and many others.

Fuzzy searching gives you the ability to find a set of words based on a common root. A fuzzy search on *postal* will also find *postage* and *postman*, because all



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are based on *post*. In many cases, a fuzzy search will return better hits than a simple wild-card search.

Synonym and concept lists are two closely related capabilities that expand your ability to find information. Synonym lists are groups of terms that all mean the same thing. For example, you can create a list that contains the words *mom, mother,* and *ma*. A search phrase including *mom* returns documents that contain any of the terms related through the list.

Like synonym lists, concept lists group search items. But while synonym lists are single words, concept lists are entire search phrases. For example, the three search phrases "General within-words: 10 Hospital," "emergency room," and "medi* or pharma*" all relate to hospital or medical information; you could group all three of these phrases into a concept called "medical."

It can be helpful to limit the search to specific regions within a document. Free-form database packages have explicit fields (e.g., heading, body, and address), and you can limit searches to a single field. However, other packages allow you to define implicit fields, or *blocks*, by selecting words that typically delimit a region of the document.

Index Building

All these packages (except askSam—see below) build an index containing references to the words in each document you select. This index is used in all subsequent searches. Building an index takes a significant amount of time, and indexing information requires a sizable chunk of disk space. Many of the optimizations built into these packages are designed to reduce the space required for an index or the time required to build it. For a comparison of the index sizes and indexing times of a sample text base, see figures 1 and 2 on page 294.

The most important factor in determining index size is the level of complexity of the searches that must be supported. Text management packages that simply give you a filename for each hit don't need very large indexes. Products that keep track of a word's location within a file (e.g., for proximity searching) generate larger indexes.

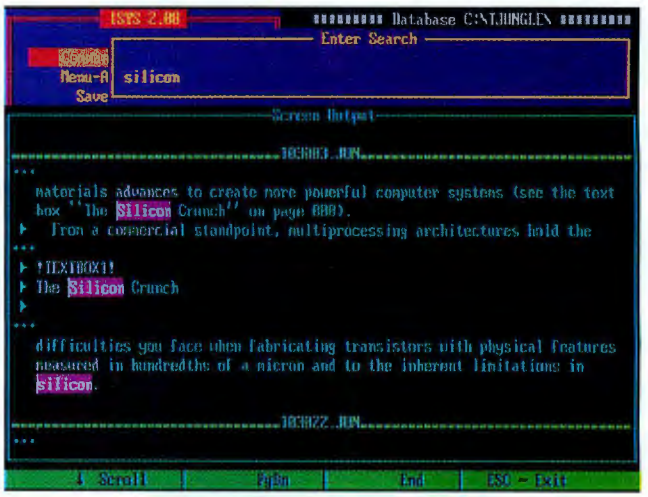
Incremental indexing frees you from rebuilding an entire index when just a few documents change or must be added. All the packages we reviewed support incremental updates. Concurrent or background indexing is also important. Concurrent indexing allows the indexing module to update indexes while you are using them to find information.

Not every word is included in an index. Some words, such as *the* and *and*, appear so frequently that their usefulness in locating information is very limited. Most of these packages provide an editable file containing a list of such *noise words*, which are not indexed.

All these packages can index raw ASCII text files. However, the documents you have in place may not conform to such a limited standard. Word processors such as Microsoft Word, WordPerfect, and XyWrite interleave control codes with the text. Many of these text managers can read or import documents in various word processing formats; in some cases, they can even preserve formatting information when viewing the document or launch the appropriate word processor on demand. A few packages can also handle database, spreadsheet, and graphics formats.

To evaluate these products, we fed them a year's worth of BYTE magazine, a total of over 650 files (see the text box "Testing Text Retrievers" on page 293 for testing details). Because we looked at each package in relation to the other tools in its category, we've divided the product descriptions that follow into the three categories.

FILE-INDEXING PACKAGES



Screen 1: *Isys's keyword-in-context display provides a handy summary of information.*

Isys 2.0

Odyssey Development's Isys is a flexible text-retrieval package for DOS systems that can be used in three ways. In addition to the interactive application, which is the form most of these packages take, Isys also includes TSR and command-line versions. The command-line version allows other programs to use Isys as a systemwide search engine, shuttling queries to Isys and reading search results using batch commands and I/O redirection. Isys sells for $395.

You select documents for inclusion in Isys's index through an interactive dialogue that builds a rule table. The rule table documents the file path to be searched, the files to be included and excluded (by name), the document type, and several other parameters. You can enter file paths directly or select them from a graphical tree.

Isys's greatest lack is its inability to automatically determine the document type. The other file-indexing packages we reviewed automatically determine file format based on extension. With Isys, you must explicitly link an extension with a document type.

Like all these packages, Isys wants a lot of memory. Its performance is heavily dependent on the amount of memory available. We saw a 20 percent difference in speed between running Isys within 640 KB and running it with 2 MB of expanded memory.

Although you can't search more than one index at a time, you can load a primary and an alternate index. Loading both lets you switch quickly between indexes, which is a reasonable compromise between the convenience of multiple-index searching and the speed of a single-index search.

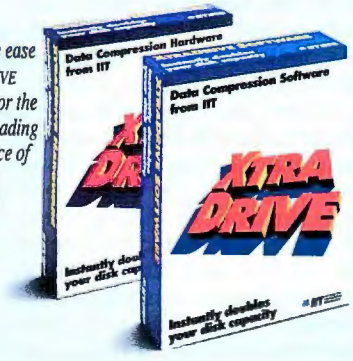
Isys's "keyword-in-context" display (see screen 1) presents all the hits in a document with either a few words or lines of surrounding text. All matches are listed in a single, scrollable display.

continued

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This is easy to use, and it provides lots of useful summary information in a limited space.

You can sort filenames returned by Isys on a variety of keys, from filename to number of hits to document size. Sorting search results is a useful and powerful capability that we were surprised to find missing in other packages.

Isys is an impressive, professional program. It's fast, powerful, and easy to use, and it acts exactly as you'd expect it to at every keystroke. Our benchmarks show that it generates index files of reasonable size. Of the three full-featured file-indexing packages, Isys was fastest.

Magellan 2.0

Lotus's Magellan is the Swiss Army knife of text management programs. Search and retrieval is just a part of what it can do. Magellan edits ASCII text files, performs file compression and decompression, undeletes and compares files, and more—all, as the late-night TV pitch might go, for just $99.

Magellan is the quickest of the file-indexing packages on the PC, and it produces the smallest index files. However, it also provides the least sophisticated searching capabilities. Magellan will tell you if a file contains a word—period. If you need to look for multiple phrases within certain distances, Magellan simply is not up to the task.

Magellan understands an amazing array of file formats. Where others provide support for four or five formats, Magellan supports over 30, from dBase to Lotus 1-2-3 to XyWrite. It can even look inside .ARC and .ZIP archives and view the compressed files. Magellan may be just a quick-and-dirty search engine, but it's a wonderful way to travel around your hard drive and browse through documents.

Magellan's default setting is to use fuzzy searches, and the package has two search features that other packages lack. The first is an incremental search: Magellan shows you matching documents as you type your search criteria. It is also the only package to provide keystroke recording for automating repetitive tasks.

The results returned by a Magellan search are a little strange. Instead of simply listing the number of hits and the number of files containing hits, Magellan returns a "ranking" factor from 1 to 100 for each file. Values in the 70s and above indicate direct matches—Magellan found the exact word you typed. The more hits per file, the higher the score. Numbers below 70 indicate matches from fuzzy searches. This takes some getting used to, and we're still not convinced that it's a more useful metric than a simple list of hits.

Lack of sophisticated search methods and odd reporting conventions make Magellan less useful than other packages when searching through virtual reams of documents for related text. However, Magellan's combination of other file management utilities with search and retrieval makes it ideal for organizing your file structure and tracking down the occasional lost file.

On Location 2.0

After spending hours forging through documentation discussing high-end, complex search algorithms, it was relaxing to turn to On Location, a breath of absolute simplicity. On Location's manual—which documents each feature clearly, if concisely—was so small that we lost it three times while writing this review.

On Location is to the Mac what Magellan is to the PC: a simple, relatively inexpensive ($130) text-retrieval program. On Location provides very few options. You can't even choose to index a subset of the files on your disk. With On Location, it's all or nothing. This can be painful, particularly if your files represent only a small subset of those available on a large server. Luckily, On Location builds very small index files—the smallest we saw in this review.

On Location works best in small, personal environments. Indexing all files on your local drives is the best application. In this environment, it is quick, easy to use, and intuitive.

On Location installs as an INIT and a desk accessory. It locates files by name or by content. You can view files from On Location or choose to open or print them, which automatically launches the document's creator. All printing must be done through the creating application; if the application is not available, you can't print the document.

On a Quadra 900, On Location indexed our 10 MB of sample documents in just over 6 minutes. After building this primary index, On Location also runs incremental updates each time you run the program and at timed intervals.

Searches are rapid but limited. On Location provides none of the more sophisticated searches. Only simple Boolean AND and OR operations are supported. Even wild cards are missing, although On Location will do fuzzy searches. The lack of wild-card searches is annoying.

Like Isys, On Location lets you change the order in which the search engine presents file hits. In On Location, it requires only a simple click on a title heading. For personal productivity on the Mac, On Location is a good choice.

Sonar Professional 1.0

Sonar Professional has a powerful and sophisticated search and retrieval engine, which is unfortunately buried beneath a confusing and infuriating user interface. Exploring the menu occasionally launches the application off into unintended long operations. On-line help is nonexistent; time after time, we had to dig through the manual to determine our next step.

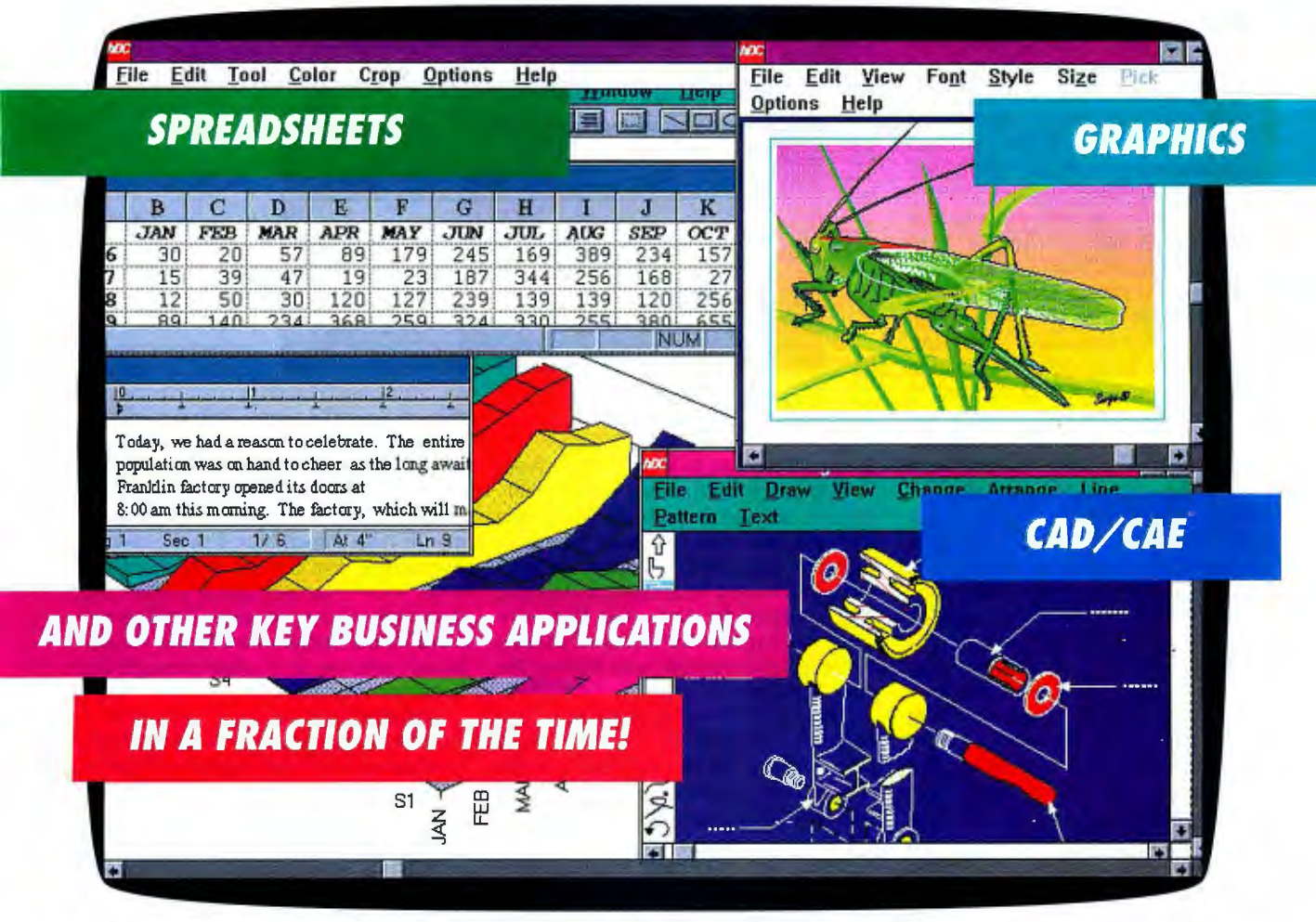
The program comes in two versions: Sonar Professional for Windows 1.0 and Sonar Professional for Macintosh 7.0. We timed only the Windows version but had a chance to evaluate the Mac package as well. In most aspects, including the user interface, the packages are identical. The Mac version offers all the features—and suffers from all the difficulties—of the Windows version. Each package costs $795.

Sonar Professional provides separate indexing and search modules: Sonar Setup and Sonar. Sonar Setup offers two levels of indexing, called normal setup and super setup. Normal setup adds an index file to each and every subdirectory you select. Super setup, which is optional, reorganizes these indexes for quicker lookup.

Sonar Setup can index entries in a directory or in a directory and all its subdirectories. You can't choose which files to index except at this directory-by-directory level; Sonar Setup indexes all ASCII files and other formats it recognizes. When the search program looks for a word or phrase, it scans the directory tree, looking in each directory for the subindexes built by normal setup.

At first, Sonar's normal setup scheme seemed a little bizarre. However, it does make the indexing structure somewhat more flexible. Since indexes are in the same directory as indexed files, Sonar Setup does not need to store the complete file path in each index. This lets you move the contents of a complete directory (including the subindexes) to a new location without having to rebuild an index. Unfortunately, the price of flexibility is very slow searches. Where other indexers returned results in seconds, Sonar

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took over 2 minutes per search, regardless of complexity.

Sonar Setup's super setup process creates an integrated index that vastly decreases search times, placing Sonar Professional in the ballpark with the other indexing packages. That makes sense, since super setup creates an organization that more closely corresponds with that of the other programs. While normal setup arguably provides an extra level of flexibility, its slow search response renders it almost useless.

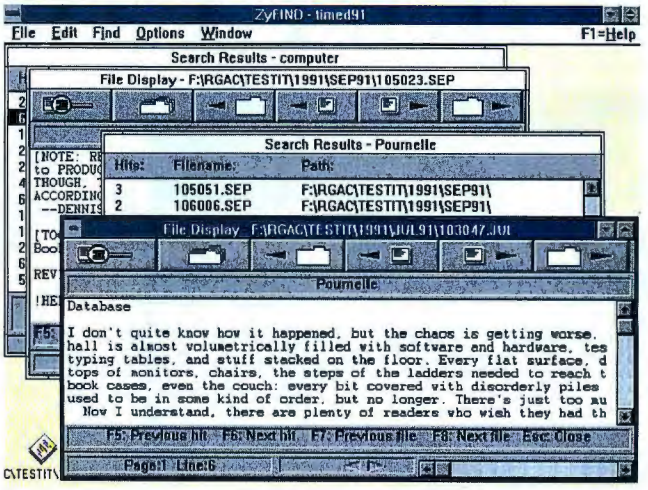
Sonar Professional's indexes are unbelievably large. Normal setup produced indexes that were larger than the original text. Super setup doubled this amount. Thus, you must have free space equal to twice the amount of text to be indexed.

Once beyond the setup and interface problems, we found Sonar Professional to be a powerful package for free-form searches. Its advanced capabilities include phonetic searching, finding associated words, and relational searching. The phonetic searches are essentially synonym searches at the syllable level. The associated word list lets you select a word and then display all other words that appear within a certain distance. The default value of 10 words provides a good balance of useful terms without listing all the words in the index.

Relational searching is a concept that takes a while to sink in—and even longer to learn how to use properly. Given a list of words and phrases, Sonar can determine if any two of them are related through a path consisting of the other phrases. Suppose you have a list of terms: Frank, Bob, Howard, Joe, President, Manager, and Financial. A relational search on Frank might produce the following: Frank > President > Joe. This tells you that the terms Frank and Joe are related, because they both appear near the term President. This is useful for seeking information relations that would otherwise be hidden.

It's an intriguing concept, but the need to define a set of terms for the linkages indicates that you know what the linkages may be and need to verify your hunch. A much more useful feature would be the ability to search through the index and determine which other words are related through a chain of limited length.

Virginia Systems Software Services has obviously worked hard on the guts of this package. Now it should work on getting the user interface up to speed. Sonar Professional has the potential to be one of the best indexers, but its frustrating interface and indexing scheme make it just too difficult to use today.



Screen 2: *ZyIndex allows multiple query-results and document windows to be open at one time.*

ZyIndex 4.02

In stark contrast to Sonar Professional, ZyIndex for Windows is extremely easy to use, and it conforms well to the standard Microsoft Windows interface. Although difficult to quantify, ZyIndex for Windows just feels right. ZyIndex is also available for Unix and DOS systems, but ZyIndex for Windows indexes are not interchangeable with those of the other versions.

ZyIndex for Windows consists of two programs: ZyBuild and ZyFind. These programs can run concurrently. You can choose files for indexing using standard DOS wild cards, selecting an individual directory, an entire drive, or anything in between. One of ZyBuild's most powerful features is its ability to index files in unrelated directories, whereas other packages will allow only a single directory and all its descendants. You can explicitly include or exclude files by name, ensuring, for example, that you do not index any temporary (.TMP) files.

The ZyFind portion of ZyIndex is easy to use. A logical, menu-driven query dialogue lets you build complex queries easily. An on-line thesaurus helps you search for concepts and synonyms in addition to specific terms. ZyIndex lets you keep multiple query-results windows open simultaneously (see screen 2).

ZyIndex for Windows has the right feel and is easy to use.

One of ZyIndex's few annoying limitations is its inability to search for information once a document is in the viewer. Frequently, you'll want to find a document with a certain search phrase and then look for related terms in the document with a simple word finder. In ZyIndex, you need to page through the document manually.

ZyIndex displays the total number of files found, the total number of hits in all documents, and the number of hits in each document. ZyIndex doesn't let you sort this output by hit frequency or filename; the files appear in the order in which they were indexed. Although this is not much of a concern when only a few documents match the search criteria, it makes scanning results difficult when there are only one or two documents with large hit frequencies lost in the noise of many files with small hit frequencies.

ZyIndex has several unique searching features. You can limit searches to specific names and date ranges. The search engine handles numbers intelligently, for example, matching "3" on a search for "3.00." The quorum function rounds out ZyIndex's unique capabilities. It requires a document to contain a minimum subset of a word list. You specify a list and the minimum number of words that must be found in that list to generate a hit.

The benchmark tests show that ZyIndex is a little slower than Sonar Professional and quite a bit slower than Isys. Index files were slightly larger than those of Isys. ZyIndex provides rapid response and a clean feel, and it meshed well with our work styles. Its $395 price tag is typical for this class of package, but its ease of use is exceptional.

continued

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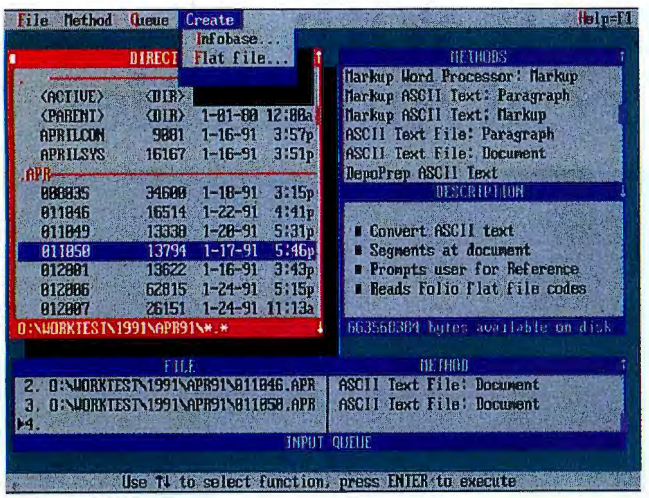
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TEXT LIBRARIES



Screen 3: *Folio Views has a utility for queuing up multiple files, converting them to a suitable format, and creating an infobase.*

Folio Views 2.1

Unlike file-indexing packages, which leave search documents in place in your directory structure, Folio Views gathers your documents into a single large compendium of files. It indexes these and also adds the index into the library. While this requires more overhead than a simple file indexer, it also makes Folio Views ideal for archiving and distributing information. Folio Views sells for $695 in a single-user version.

Once you've built a Folio Views text library (an *infobase*, in Folio parlance), you can search with an integrated set of tools and a very functional interface. Getting to that point is the problem. The tools for building and configuring an infobase are not smoothly integrated, nor are they easy to use individually. And the documentation only makes matters worse.

To be fair, it was not difficult to simply pull together a set of unformatted files and create a usable infobase. We had to queue up each file one at a time, since wild cards are not accepted, but Folio Views loaded these into a single structure and created an index automatically.

As you enter a search query, a window displays the index and performs an interactive lookup. By striking the Tab key, you can cycle to the beginning of each file in the infobase. And you can collapse the files to show only the first line or the first few lines, in effect producing a simple outline of the infobase structure.

You can add structure to an infobase as you work with it. You can easily join files (i.e., "folios") into groups, set up hypertext links to other folios or other infobases, and even establish headings and subheadings as you go. The integrated editor lets you edit and organize an active infobase. Unstructured infobases proved surprisingly flexible and useful. In fact, we ended up drawing our BYTE files into an infobase and then creating organizational groups after the infobase had been built. We then tacked on a separate file with embedded links to create a table of contents.

To take advantage of the real power of Folio Views, you need to start with a set of structured text files. The structure does not have to follow a specific format, but Folio Views needs to know which elements are headings, which are the beginnings of sections, and so on. Folio Views ships with an impressive range of word processor filters to convert common formats into Folio codes. Folio Views' PREP utility (see screen 3) helps to automate the process.

The trick is getting along without useful documentation. Instead of moving through the construction of a sample project, the Author's Guide tries to explain many different ways of doing the same things. This is confusing, especially since some of the methods are cryptic.

Folio Views displayed excellent performance and efficiency. Not only was the original indexing fast, but incremental indexing is done on the fly, with a negligible performance hit. The files and indexes are combined and compressed so that the final size of the infobase (even with the index included) is smaller than the total size of all the original files.

Once you understand how to use the construction tools and how to format text files for input, Folio Views delivers impressive results. You can distribute infobases complete with a slick windowing environment, hypertext links, and a solid search engine. You end up with a nice mix of performance, usability, and storage efficiency. And anyone who runs NetWare will have a viewer available as well as a working demonstration model. Despite its complexity and poor documentation, Folio Views is an excellent program for organizing and distributing your data.

re:Search 2.12

MicroRetrieval's re:Search ($795 for a single-user license) is a bit difficult to classify. Although it is clearly a tool for collecting and distributing a set of documents, re:Search does not combine the documents into a single structure, as Folio Views does. Even so, re:Search works better as a tool for distributing an organized set of data than it does for managing large numbers of dynamic text files on your hard drive or network.

Collections of documents are called libraries in re:Search. Each library is separated into subject areas, which in turn are divided into catalogs. Only the catalogs can contain the documents themselves. The other designations are purely organizational divisions. For our project, we created a library called BYTE 1991 and built catalogs for each month. Individual articles resided in the catalogs.

When you create a catalog heading, you specify a path to the documents making up the catalog. Once you have set up the catalog, you can load all the documents in the catalog directory or select files by extension.

Although the files are left in place and wild cards can specify a set of documents for a catalog, reindexing a catalog will not include new documents in a directory. You must perform a load operation first. Reindexing will index only the filenames already established in the catalog; it will not gather new ones. In fact, if you delete a file from the directory and try to reindex, re:Search will report an error and rather inelegantly blow you out of the program entirely.

You can embed references to PCX and TIFF files in your text files so that they can be viewed from a re:Search document, but you can't designate hypertext-style links for easy navigation across catalogs. And even though you are able to view and even attach text notes to your documents, you cannot edit within re:Search.

The best part of re:Search is its organizational structure, but this structure also

imposes some restrictions. You have to specify a single catalog to perform a search, so you cannot search across an entire library. You can also reindex only one catalog at a time. This ends up imposing a serious performance hit. Compared to the on-the-fly reindexing offered by Folio Views, re:Search's updating mechanisms are slow and far too manual.

FREE-FORM DATABASE MANAGERS



Screen 4: *With askSam, you can drop a field-definition template over existing data, quickly loading free-form text into structured fields.*

askSam 5.01

This package is like that junk drawer most of us have at home. You can throw just about any type of information, structured or unstructured, into an askSam database and be able to find it later when you need it. At $395 for the single-user edition, askSam deserves a close look.

With askSam, you can easily store a group of unformatted text files in an unstructured database. Even without a defined structure, you can perform complex queries, including wild-card designators, Boolean expressions, and proximity searches. You can browse through your data, jumping to each occurrence of a search hit, or you can create a subset of records by tagging them. The askSam hypertext feature simply feeds a word from within a record to the search engine.

Also, askSam lets you define fields to better structure your data. Fields can be defined up front, or you can create templates for field definitions. You can pull up a record and then place the field template on top of it. In this manner, you can take a record that contains header information, and by applying your template to the record, you are able to turn the header information into fielded data (see screen 4).

The askSam package combines the searching features of a text indexer with some of the more powerful capabilities of a database manager. You can sort on fields or on words in a free-text document and send the result to a disk file. You also are given some strong reporting features for formatting your output. This includes such things as headings, footers, and tallies.

As a database manager, askSam has relational capabilities. You can search one file and then scan a second file, depending on the results of the primary search. You might have a database of names and a second database of memos. You could produce a list of the names in your primary database along with a listing of all the memos you have sent to each name.

A number of features make askSam an interesting product. Although it does not create a full-text index, it scans text with surprising efficiency. We had no problems searching through our BYTE articles without the use of an index. However, as the database grows, searches slow down. The package can index on data fields, and it automatically searches through any newly added, unindexed material after the indexed search is complete.

Perhaps because of its flexibility or perhaps because of its uniqueness, this program is somewhat difficult to learn. However, if you are willing to invest some time and energy, askSam can give you control of your textual data.

continued

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Concordance 5.10

Dataflight's Concordance employs a standard database structure to store and index large amounts of textual data. It includes a "paragraph" field type, which can store free-text documents of up to 64 KB. Documents larger than this limit are divided into multiple records. You can define fixed fields for traditional fixed-length data and reserve the paragraph fields for explanations or free-form notes, or you can load text files into the paragraph fields and load the associated fixed fields with identifying information, such as article name, author, and issue number. You can then search the entire database or only the fixed fields using a powerful query language.

You create a Concordance database by first defining field names and types. You must define a paragraph field if you want to import large free-text files. Once the structure is defined, you can use wild cards to import multiple documents. You can specify each document as a single record, or you can provide delimiters to break up a large file into multiple records. You can then place identifying information into the other data fields.

It's fairly easy to get data in and out of Concordance, but it's not easy to retain the document format. When loaded, our (DOS) documents had carriage returns/linefeeds at the ends of paragraphs. When exporting documents, we could specify only one character to designate paragraph breaks, so the exported documents did not have the carriage return/linefeed pair at the ends of paragraphs.

A search query returns a subset of found records. This becomes, in effect, the acting database, available for further narrowing of the data. You return to a view of the entire database by searching for all records with a wild-card entry. Queries can be saved and recalled easily. You can also sort the entire database or a subset. You simply tell Concordance which fields you want to sort on.

From Concordance's document mode, you can edit files, perform search-and-replace operations, and import additional text into the database. You can also apply overlay files to a document to insert delimited data into predefined fields or to serve as a text template. Concordance does not allow hypertext-style linking from within a document.

The Concordance programming language supports a wide range of file management, query-control, text-manipulation, screen-presentation, and data-handling functions. However, we found the basic operation of the package somewhat limited. Especially disturbing was the length of time it took to create indexes. Although the manual suggests some methods (e.g., freeing up memory and adding disk caches) for improving this performance, we have to question a product that takes over 7 hours to index 10 MB worth of data on a 50-MHz 486.

Concordance offers a strong structural approach for cataloging and presenting large amounts of text and data, but given its lackluster performance and steep price ($995), we can't recommend it.

IdeaList

Although ideaList acts in many ways like a database, it does not insist on a rigid structure. You can set up fields and use ideaList like a traditional database, or you can simply import text files

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as records. While flexible, this approach is not designed to manage dynamic files.

This package rarely follows a traditional approach to any task. To define the fields in your database, you create entries in a definition file. You design a new record type by prefacing the name of the record with a colon. The record name is followed by the names and types of the fields within that record.

To import records, you design a file to tell ideaList how to format the incoming ASCII data. The program can handle delimited files, dBase files, or records with tagged fields. You can also import a group of text files with a wild-card designation, and each file will be brought in as a separate record.

When you enter a search query, ideaList creates a hit list of all the records containing the requested term. The active database of records is then narrowed down to the subset of records matching the query. You then further narrow the search by simply entering another query. In addition, you can tag the records you want included in the hit list or drop records from the list one at a time.

Simple macros are supported in ideaList. You list all your macro definitions in a single text file. The macro facility lets you record operations and save them to the definition file. You can distribute a run-time module with your finished databases so others can access the data.

Building the database is a time-consuming process, as the benchmarks show, but performance on edits and updates is outstanding. Updating its index on the fly, ideaList performs simple updates to edited records almost instantly.

This package offers a simple means for bringing together free-form text into a searchable database structure, but it lacks the programming power of askSam. Although the price ($225) is alluring, ideaList has some structural weaknesses. For example, it cannot handle text files larger than 64 KB. Files larger than the limit are simply left out of the database. Creating I/O formats, while flexible, can be complicated and requires a certain amount of computer proficiency. The program lacks polish and some of the more advanced interface features expected of today's software.

Top Management

If you are planning to impose some organization on what is now a sea of scattered text files, you have several good choices. From among the file-indexing packages, either ZyIndex or Isys will serve you in good stead; we have a hard time choosing between the two. Both offer solid search capabilities and innovative interfaces, but we found Isys a little more to our taste. Of course, ZyIndex is the only option if you want to run under Windows.

Folio Views is our choice for building text libraries. Though somewhat complex, it builds the most accessible and powerful structure for holding large amounts of relatively stable information.

If you need to perform sophisticated sorting and data manipulation, askSam is the best of the free-text databases. It effectively applies database functionality to textual data and handles structured or unstructured data with ease. ■

Raymond GA Côté and Stanford Diehl are testing editors for the BYTE Lab. You can contact them on BIX as "rgacote" and "sdiehl," respectively.

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Writing in Style

The BYTE Lab tests the top WYSIWYG word processors for Windows and the Mac

D. BARKER, DAVID L. EDWARDS, AND STAN WSZOLA

Cranking out documents with an old-style, text-based editor isn't quite as difficult as working blindfolded, but it's tough to produce sharp-looking pages with a package that lacks graphical orientation. Although non-WYSIWYG word processors can produce a handsome final product, you won't see what you'll get until you get it. That's fine for people who like surprises. But if you work in a busy environment, where the deadline is always yesterday, you need an editor that gives you a clear idea of how your document will look before it comes off the printer. You need a product that does word styling as well as word processing.

The nine WYSIWYG word stylers reviewed here won't transform dull prose into Pulitzer prize material, but they can make it easier to turn out polished-looking documents. Besides the ability to mix type styles and page formats—and closely approximate final output on-screen—the packages we evaluate have two other points in common: All are Windows- or Mac-based programs and all carry list prices of $500 or less. Due to space constraints, we couldn't include two notable products in this report. Lotus Write is a trimmed-down, less expensive version of Ami Pro. And we reviewed WordPerfect for Windows in our March issue. For a comparison of how these products stack up on a feature-by-feature basis, see the table on page 309.

The Benefits of WYSIWYG

With word processors that lack WYSIWYG capability, the best way to get a sense of how your final document will look is through a program's print preview. This feature generally works well for such things as ensuring that headings are centered and checking that you haven't left the last line of text standing all alone on a page. But if you want to know now how your printed manuscript will look, you should buy a WYSIWYG word processor.

When appearance matters, a WYSIWYG program offers the most efficient means of preparing your material. Today's best word processors not only can display different fonts on the screen, but they can flow text into multiple columns, mix different column widths on the same page, and import and manipulate graphics. They don't have the sophisticated typographical controls of advanced DTP (desktop publishing) programs—nor do they offer as complete control over placement of the elements on a page—but WYSIWYG word processors do let you produce a simple three-column newsletter or the like, without going to the expense of buying and mastering an intricate DTP package.

Although these packages are not full-fledged publishing software, many of them use the same techniques and metaphors as DTP programs. Some use a frame-based approach for setting up a document.

Frames are adjustable rectangles into which you place text and graphics. The procedure varies, but the concept is the same: You draw the frame where you want it on the page, then pour the text or image into that block.

Some of the programs save you the trouble of setting up a page by providing a template, a predefined layout format. All the packages reviewed let you design style sheets, which are catalogs of formatting commands that automatically set the look of the text. If, for example, you publish a newsletter that always has boxed information you want to run in smaller type than the rest of the publication, you could set up one style sheet for your main text and another for the text that goes in the box. Choosing the name of the appropriate style sheet formats the text to the desired specification. Style sheets greatly simplify the process of formatting text.

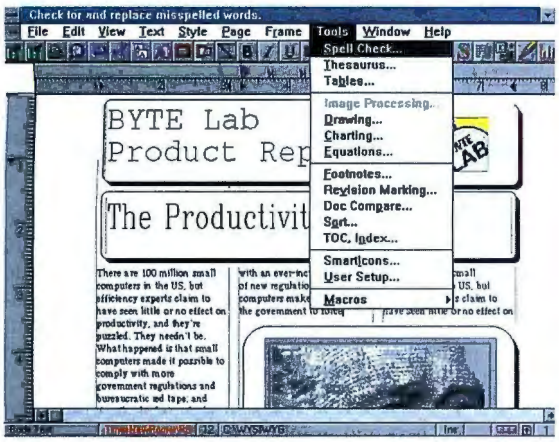
Put to the Test

To see if this group of graphical word processors could produce the kinds of documents that once were the province of DTP software, we used Aldus's PageMaker to devise a test document resembling a typical newsletter. It has a three-column format and a full-width banner headline and includes multiple type styles and sizes, imported graphics, tables, rules, and page numbers. Then we tried to duplicate the newsletter using each of the word processors.

Our aim wasn't to judge the packages on the basis of their page-layout functions. Rather the newsletter model allowed us to see how well the programs fare when their graphical capabilities are pushed—when they're asked to juggle multiple columns, type sizes, fonts, design elements, several pictures, and check the spelling while they're at it. We reasoned that, if a word processor can handle basic DTP chores, it can handle any word processing chore you might toss its way.

In addition, we evaluated each package's WYSIWYG quotient: Is what you see on the screen really what you get on the printed page? For most packages we found that it is. Because the type displayed on-screen doesn't exactly match the type that comes out of the printer, however, minor differences sometimes crop up.

WYSIWYG word processors can be slow on the wrong hardware. We ran the Windows packages on 386es and 486es, and the performance was fine. On a 386SX with less than 2 MB of RAM, however, performance can feel sluggish, particularly when a page contains graphical elements. We tested the Macintosh programs on an SE/30, an SE, a IIfx, and a Mac II with a Radius Rocket. For the most part, program execution felt snappy. On a Quadra, the packages sang.



SUMMARY

AMI PRO 2.0

PROS Toolbar allows for fast formatting; powerful macro language; flexible frames for page design; good handling of graphics; integrated E-mail

CONS Cryptic icons; macro developer's kit not included; lacks drag-and-drop operations

AMI PRO 2.0

Ami Pro is a blue-blooded Windows application. Its not-too-distant ancestor, Ami, was the first word processor designed for the Windows environment, which means it was developed from the ground up to be a graphical editing program. For Ami Pro, WYSIWYG capability comes naturally.

It's clear from the first time you set eyes on the program that its developers love icons. The toolbar just below the menu bar at the top of the screen is packed with graphic representations of the most common editing and formatting functions. While working with these icons can save you time and mouse-clicks, as with Word for Windows, it takes practice to remember what each one does. Instead of memorizing each function, you may prefer to create customized icons by redefining the operation of existing icons or designing new ones using any bit-mapped Windows file. You can't, however, change the menu command bar except by adding a command with the package's macro programming language.

As a text editor, Ami Pro is superb. Memory permitting, you can open a maximum of nine windows, each containing a different file. In addition, you can open two windows to display the same file, although you can edit in only one window at a time. Unlike Word for Windows, Ami Pro uses Windows' Multiple Document Interface, so you may reduce several documents to icons, which makes it easier to move between documents.

Ami Pro uses style sheets to define a document. You can work with the default style sheets, edit the sample sheet included in the package, or create your own. Like many of its competitors, Ami Pro takes a frame-based approach to adding graphics, special text, and tables to a document. To add these sorts of elements to a document, you set aside defined regions called frames and move information into them. When you move and resize a frame, text outside the frame flows, or wraps, around it.

Creating the test newsletter with Ami Pro is relatively easy. You can start with a predefined style sheet or modify the default style sheet. After importing the sample text file, you pull down the Page menu, click on the Page Layout option, and enter the number 3 to indicate how many columns you want. The text then immediately rearranges itself into three snaking columns.

Working with frames gives you a good deal of flexibility in setting up your page. Ami frames, which can hold text and graphics, are easy to work with. To assemble the test document, you click on the Frame menu item, select the Create Frames option, and insert one frame each for the newsletter's headline, subtitle, and graphic element. You can insert text for the headline and subtitle in Layout mode and experiment to get exactly the right font and size. If you want to move a frame, you simply click on it and drag it. Inserting a graphic element into a frame is just as easy; Ami translates the file format and automatically resizes the graphic to fit the existing frame.

When compared against Word, Ami

BYTE ACTION SUMMARY

- **WHAT WYSIWYG WORD PROCESSORS DO**
  Let you type and edit text comprising varying type styles and sizes, combine text and graphics on a page, and see an on-screen display that closely resembles the printed document
- **LIKES**
  Ability to work with different fonts and type sizes, ability to mix text and images, graphical controls, ease of learning
- **DISLIKES**
  Snafus when manipulating graphics, memory and hardware demands, sluggishness on lower-end PCs
- **RECOMMENDATIONS**
  Microsoft Word and Ami Pro are the best WYSIWYG word processors under Windows. They're similar in capability, but Word has drag-and-drop editing; Ami Pro handles graphics better and has a good macro language. On the Mac, Word 5.0 is the best for most typical word processing jobs; it's fast and it's intuitive. WordPerfect is equally capable, but is better suited for complex documents, and stands alone in its use of QuickTime movies.

has one shortcoming: It lacks the ability to move a block of text within a document by dragging and dropping it with the mouse. With Ami, you must define the block of text and use your keyboard's cursor keys to move it to a different location, a minor inconvenience.

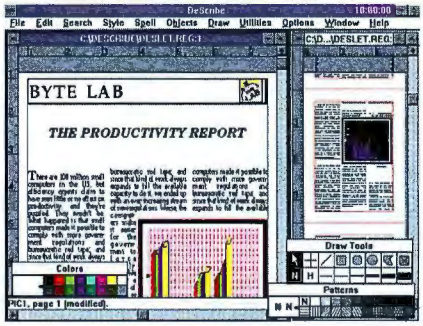
One of Ami's greatest strengths is its macro programming language. It lets you combine a rich variety of programming statements with the built-in macro functions and the standard Ami Pro functions to create very powerful word processing tools. The macro language lets you add entries to the command menu bar, as well as create pop-up dialog boxes, keyboard shortcut commands, and your own pull-down menus. You can apply these alterations to the entire program or limit them to a particular template. You can even create applications for use from within Ami; sample macros provided with the package include an address book and an area code directory.

To generate a new macro, you simply click on the Record Macro function. Any macro may be edited and played back to test its functions. Lotus also sells a Macro Developers Kit ($9.95) that includes a substantial manual and a floppy disk containing a large collection of sample macros.

Ami Pro can import text from just about anything. It directly imports 26 different file formats and will attempt to import others, as well. The list of compatible formats includes not only word processors, but spreadsheets such as 1-2-3, Excel, and SuperCalc and databases such as dBase and Paradox. It can exchange files with other Windows applications through cut-and-paste Clipboard operations, DDE (Dynamic Data Exchange), and OLE (Object Linking and Embedding).

Ami Pro holds an edge when working with graphics files. You can do the usual scaling, moving, and rotating, but it also lets you manipulate gray-scale TIFF files by changing brightness and contrast, enhancing edges, and smoothing areas. Another plus is Adobe Type Manager, which greatly improves the appearance of text on the screen—especially for very large fonts—and makes available a wide range of fonts.

Ami Pro 2.0 is even better than the previous version. It is a good program right out of the box and an ideal choice for the user who needs a macro language. The combination of its native features, macros, and Adobe Type Manager give Ami Pro the wherewithal to handle any WYSIWYG word processing task.



SUMMARY

DESCRIBE WORD PROCESSOR 3.0

PROS Operates like a page-layout program; permits a large number of open files; lets you undo a series of actions

CONS Style sheets are difficult to learn; graphics handling sometimes is slow

DESCRIBE WORD PROCESSOR 3.0

DeScribe, which runs under Windows or OS/2 PM (Presentation Manager), is part word processor and part DTP program. Once you get the hang of using it, this can be a good package for assembling newsletters and the like, but for mundane writing tasks, it's probably overkill.

The program is object-oriented in that it handles text and graphics in separate, movable "object" areas, or windows. A text object may contain only text; a graphics object may contain only imported graphics or drawn elements. You can combine the two types of objects on a page, selecting and moving the object windows to produce the layout you want. To change your view of the workspace, you move a sliding bar that zooms in or out, enlarging an area by 500 percent or reducing it to 10 percent of its original size.

DeScribe's editing screen has a typical Windows layout: four small toolboxes for patterns, colors, drawing tools, and text tools. You can drag the boxes around and put them anywhere on the screen or remove them, and you can choose to display the graphics toolboxes only when graphics objects are selected.

We used DeScribe's style sheets to set up the banner headline for the first page of our text newsletter. It proved to be a formidable task to learn how to create style sheets for pages with adjacent text boxes of different widths. Even setting up a style sheet for a single line of text three columns wide isn't easy. On top of that, DeScribe sometimes has trouble creating a true drop cap (a larger than normal uppercase letter such as the one that appears at the beginning of this article); in several cases, the drop cap overlapped the character below it, text was not indented, or the first line of text was enlarged rather than just the first letter of the first line.

We also had minor problems with the program's spelling checker. First of all, it doesn't issue a prompt or message to tell you it has finished checking a document. More troubling, to recheck your document, you must exit DeScribe and then reopen the file.

DeScribe feels sluggish when handling text and graphics files on the same page. The program tends to redraw images after every carriage return during text entry, whenever you click out of a dialog box, and during cut-and-paste operations.

Selecting a graphic element does not always produce visible "handles" for moving an object, but even if it doesn't, you can move it with the mouse by dragging the cursor across the image. Resizing an image in a graphic object is very difficult when the handles are obscured by the borders surrounding the object. Cropping graphics is quite easy, though.

For those who forget to save their work periodically, DeScribe offers a snapshot feature that automatically saves your text at regular intervals—a boon for times when Windows crashes unexpectedly. When you reload DeScribe, the program asks whether you want to open this snapshot file.

DeScribe can import and export more than 40 text-file formats, including Ami Pro, 1-2-3, Word, MultiMate, Q&A Write, ASCII, WordPerfect, WordStar, XyWrite, and many more. It can also import a wide variety of graphics formats, among them DXF, GEM, CGM, PCX, PM and Windows bit maps, GIF, and WPG.

Unlike some of the WYSIWYG word processors, DeScribe has the feel of a DTP program. Like a few of the other word processors tested, it can be a little slow at handling graphics, but the package has some very powerful features, including the ability to open an unlimited number of files on-screen simultaneously and the ability to undo every change made to a document since the last save. This package undoubtedly will continue to improve with age.

continued

WINDOWS WORD PROCESSORS COMPARED

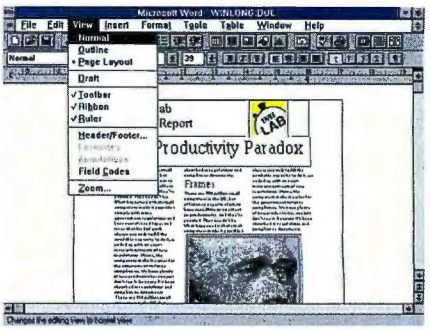
For WYSIWYG word processors to be truly useful for turning out good-looking text and page layouts, they need strong editing, formatting, and graphics capabilities. (● = yes; ○ = no.)

Product	Ami Pro 2.0	DeScribe Word Processor 3.0	Lotus Write for Windows 2.0	Microsoft Word for Windows 2.0	Professional Write Plus 1.0	WordPerfect 5.1 for Windows	WordStar for Windows 1.0
Company	Lotus Development Corp.	Describe, Inc.	Lotus Development Corp.	Microsoft Corp.	Software Publishing Corp.	WordPerfect Corp.	WordStar International
Price	$495	$495	$199	$495	$249	$495	$495
Editing Features							
Spelling checker	●	●	●	●	●	●	●
Grammar checker	●	○	○	●	●	○	○
Thesaurus	●	●	●	●	●	●	●
Outliner	●	○	●	●	○	●	○
Mail merge	●	●	●	●	●	●	●
Undo	●	●	One level only	●	●	●	●
Math functions	●	○	○	●	○	●	○
Equation editor	●	○	○	●	○	●	○
Timed automatic save	●	●	●	●	●	●	●
Context-sensitive help	●	●	●	●	●	●	●
Draft mode	●	○	●	●	●	●	●
Max. number windows	9	Memory dependent	9	9	Memory dependent	9	1
No. file formats imported	28	39	27	14	4	16	30
No. file formats exported	19	41	19	12	6	16	30
Long-Document Features							
Creates index/table of contents	●	●	○	●	○	●	○
Cross-referencing	○	○	○	●	○	●	●
Page marks/bookmarks	●	●	○	●	○	●	●
Customization Tools							
Macro learn mode	●	●	●	●	○	●	○
Macro editor	●	●	●	●	○	●	○
Macro programming language	●	●	○	●	○	○	○
Customizable main menu	Icons only	●	Icons only	●	○	○	○
Dynamic Data Exchange	●	●	●	●	●	●	●
Object Linking and Embedding	●	○	●	●	○	○	○
Groupwork Editing							
Document notes	●	○	●	●	●	●	●
Redlining	●	●	●	●	●	●	●
Document summary	●	○	○	●	○	●	○
Formatting							
Style sheets	●	●	●	●	●	●	●
Conditional page breaks	●	●	●	●	●	●	●
Widow/orphan control	●	●	●	●	●	●	●
Automatic hyphenation	●	●	●	●	●	●	●
Snaking columns	●	●	●	●	●	●	●
Side-by-side columns	●	●	●	●	●	●	●
Kerning and tracking control	●	●	○	●	○	●	●
Document queues	●	○	○	●	○	○	○
Printing in background	●	○	○	○	○	○	○
Graphics							
No. file formats imported	12	28	12	28	11	16	9
Sizes/crops/rotates graphics	●	No rotation	No rotation	No rotation	●	●	●
Moves graphics frames	●	●	●	●	●	●	●
Flows text around graphics	●	●	●	●	●	●	●
Page preview	●	●	●	●	●	●	●
Draws lines/boxes/borders	●	●	○	●	●	●	●
Drawing tools/program	●	●	○	●	○	○	●
Table editor	●	●	○	●	○	●	●

MAC WORD PROCESSORS COMPARED

For WYSIWYG word processors to be truly useful for turning out good-looking text and page layouts, they need strong editing, formatting, and graphics capabilities. (● = yes; ○ = no.)

Product	MacWrite II 1.1	Microsoft Word 5.0 for the Macintosh	Taste 1.02C	WordPerfect Macintosh 2.1
Company	Claris Corp.	Microsoft Corp.	DeltaPoint, Inc.	WordPerfect Corp.
Price	$249	$495	$129	$495
Editing Features				
Spelling checker	●	●	●	●
Grammar checker	○	○	○	○
Thesaurus	●	●	●	●
Outliner	○	●	○	●
Mail merge	●	●	●	●
Undo	●	●	●	●
Math functions	○	●	○	○
Equation editor	○	●	○	○
Timed automatic save	○	●	○	●
Context-sensitive help	○	●	●	●
Draft mode	○	●	○	○
Max. number windows	Memory dependent	23	Memory dependent	Memory dependent
No. file formats imported	12	10	9	2
No. file formats exported	12	10	9	2
Long-Document Features				
Create index/table of contents	○	●	○	●
Cross-referencing	○	○	○	●
Page marks/bookmarks	○	●	○	●
Customization Tools				
Macro learn mode	○	○	○	○
Macro editor	○	○	○	●
Macro programming language	○	○	○	●
Customizable main menu	○	●	○	●
Groupwork Editing				
Document notes	○	○	○	○
Redlining	●	●	●	●
Document summary	○	○	○	○
Formatting				
Style sheets	●	●	●	●
Conditional page breaks	●	●	●	●
Widow/orphan control	○	●	○	●
Automatic hyphenation	●	●	○	●
Snaking columns	●	●	●	●
Side-by-side columns	●	●	●	●
Kerning and tracking control	○	●	●	●
Document queues	○	●	○	○
Printing in background	○	○	○	○
Graphics				
No. file formats imported	3	4	2	3
Sizes/crops/rotates graphics	●	●	●	●
Moves graphics frames	●	●	●	●
Flows text around graphics	○	●	●	●
Page preview	○	●	●	●
Draws lines/boxes/borders	○	●	●	●
Drawing tools/program	○	●	●	●
Table editor	●	●	○	●



SUMMARY

MICROSOFT WORD FOR WINDOWS 2.0

PROS Ribbon bar makes formatting easy; drag-and-drop operation; follows a page-template approach; outliner; easy to learn; OLE

CONS Doesn't support Multiple Document Interface; won't do columns of varying widths; RAM-hungry; prefers at least a 386

MICROSOFT WORD FOR WINDOWS 2.0

Microsoft Word for Windows is one of the most sophisticated, powerful, and easy-to-use WYSIWYG word processors on the market. It doesn't look so friendly when you first fire it up, though, because the screen looks cluttered. At the top of the screen are a menu bar with pull-down menus, a toolbar with cryptic icons for commonly used functions, a ribbon bar for changing the appearance of text, and a ruler bar for aligning text. You'll need practice to remember the function of each icon.

If you don't like this sort of interface, you can customize it, redefining the keyboard shortcut commands, pull-down menus, and toolbar. This customization can apply globally to the entire program or to only a particular template. You also can turn off the toolbar, ribbon bar, and ruler bar.

Word lets you open up as many as nine windows, or panes, each of which can contain the same file. Any changes made in one pane appear in the others. Or, you can open nine files simultaneously—if you have enough available RAM. You can't convert a pane to an icon because Word, oddly, doesn't support Windows' Multiple Document Interface.

Based on the template concept, Word is a sort of super style sheet. You can create your own templates or edit the demo templates included in the package.

Creating the sample newsletter with Word for Windows was surprisingly easy. The steps you follow are much like those for Ami Pro and Lotus Write. After importing the sample text file, you pull down the Format menu, click on the Columns selection, and enter a 3. Text rearranges itself in three-column format. Then you click on the Insert menu item, select the Frames option, and insert a frame for the title of the newsletter, the subtitle, and the graphic element. You'll need to do some experimenting in layout mode to get the font and type size the way you want them.

Inserting a graphic into a frame proceeds smoothly; Word translates the file format, automatically resizing the graphic to fit its frame. Text wraps around any frames you place in the layout.

A particularly handy feature is Word's use of clicking and dragging to move selected text anywhere within a document. You simply define a block of text with the mouse cursor, hold down a mouse button, and drag the cursor to where you want the text to reside—a very intuitive method for doing rough editing.

Like Ami Pro, Word makes it easy to use outlines and reorganize documents. The Outline view lets you create an outline and then enter text under the various subheads. You can collapse an outline so that it shows just the headings. When you rearrange the headings and their associated subheads, the text automatically moves to the new location in the outline.

Word for Windows can import 14 different file formats from other applications. Either directly, or via separate filter programs, Word accepts files from just about any PC source. It can import a number of graphic file types, as well, including the usual Windows formats, EPS, TIFF, CGM, HPGL, DrawPerfect, Micrografx Designer, AutoCAD 2D, and Lotus 1-2-3 Graphics.

The program can work with other Windows applications in several ways. Besides the usual cutting and pasting via DDE, which lets you swap information with Windows applications running in the background, Word also supports OLE. OLE basically embeds data from another OLE-capable application in your document. If, for instance, you want to make changes to an equation embedded in your document, you first would create the object using the Equation Editor and then embed it in your document; to edit the equation, you double-click on it and the Equation Editor fires up.

In our tests, Word for Windows did not exhibit any serious bugs. However, we have received reports from other users that, as with Ami Pro, problems surface when macro files larger than 2 KB are used. Also, because of a bug in the word counter, Word for Windows cannot compute the length of files containing more than 65,535 words. When counting words in larger files, the counter rolls over to zero. (See Jerry Pournelle's User's Column on page 101) None of these are serious flaws.

Word for Windows is a good program that has gotten better with age. If you want a WYSIWYG word processor that is powerful and easy to use, get Word for Windows.



BYTE LAB PRODUCT REPORT

SUMMARY

PROFESSIONAL WRITE PLUS 1.0

PROS Easy to learn and use; manipulation of graphics and frames is fast and intuitive

CONS Cannot combine text and graphics in the same frame; snafus crop up when the text in a frame is reformatted

PROFESSIONAL WRITE PLUS 1.0

Software Publishing's Professional Write Plus aims to make it easy to set up documents such as our test newsletter. Starting up the program for the first time may conjure up thoughts of Ami Pro; that's no surprise because it's based on Ami. The screen display—complete icon bar and styles box—looks much like Ami's, and you can customize the interface to display only the icons you use frequently. Sailing into the first session with this package produces that friendly familiarity that comes with a really intuitive product.

The program makes it easy to get started creating documents by offering 24 predefined templates for common documents, including newsletters, reports, memos, and letters. Of course, you also can customize your own style sheets.

It's a blessing to find a word processor that handles graphics with ease and simplicity. Professional Write uses the frame method of handling images within documents, and Software Publishing has made this process easier than in many other packages. You can create frames and import graphics, scaling, moving, and rotating them effortlessly and with minimal learning time. Instead of selecting a special icon or tool, you simply click and drag on the frame's handles or the graphic image to stretch it, or click and hold anywhere in the frame to move it easily in any direction. But you cannot put text and graphics within the same frame.

With Professional Write Plus, you don't need a T-square to design documents that look as if they were produced with DTP software. You simply select the frame and define how text will wrap around it, or you can create interesting effects by superimposing transparent or opaque graphics on text.

To scale a graphic and display it at the right size, you can simply click twice on the image and begin setting up the parameters in the sizing dialog box. You can define images to fit in a frame, to remain at their original size, to be reduced or enlarged by a particular percentage, or by typing in the frame's measurements in inches, centimeters, or picas and points.

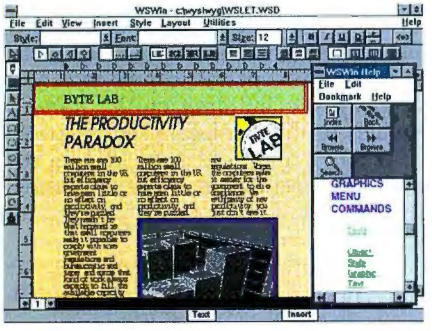
Professional Write can import graphics in SDW (Ami Professional Draw), CGM, EPS, ART (First Publisher clip art), SYM, PCL, PIC, MAC, PCX, TIF, WMF, and bit-mapped Windows formats. If you want to change the orientation of the graphic, you can rotate it, as long as it's in one of the following formats: ART, PCL, MAC, PCX, TIFF (non-gray scale), and Windows' Clipboard bit maps.

For ensuring accuracy in the words you type, Professional Write provides an integrated spelling checker, an on-line thesaurus, and the Grammatik for Windows grammar checker.

Creating our sample newsletter with Professional Write Plus went well, except for two minor snags. When entering text in a frame for the subtitle, we selected a 36-point font, and instantly the text disappeared. It was nowhere to be found and Professional Write wouldn't let us enter more text. The only option was to delete the whole frame and start over. Following the manual's procedure for creating a title did not create a line of text that spanned three columns.

continued

Aside from these problems, Professional Write Plus is a good product for writing, editing, formatting text, and laying out pages. It's very intuitive, easier to learn than other packages we looked at, and superb at handling graphics. Software Publishing has managed to combine power and ease of use in a solid WYSIWYG word processor.



SUMMARY

WORDSTAR FOR WINDOWS 1.0

PROS Buttons and toolbox make operations easy; can link text across different pages; includes drawing tools

CONS Existence of separate drawing and editing modes causes confusion; navigation between modes cumbersome; can't open multiple documents

WORDSTAR FOR WINDOWS 1.0

WordStar for Windows is capable of producing complexly formatted pages using a host of on-screen icons and menu commands. The program uses a frame-based approach and has some advanced features for text editing, page layout, and typography.

WordStar's opening display, with its host of options, is either impressive or cluttered, depending on your preferences. But even those who enjoy having numerous icons and menu choices, will find the program unwieldy at times. It offers 40 different cursor and marker types: object editing tools, text and frame editing tools, and tab alignment markers. The toolbox includes a rotation tool as well as basic drawing tools for creating rectangles, circles, ellipses, lines, and arcs.

WordStar for Windows operates in many different modes, and keeping track of which mode you're in isn't always easy. In Edit mode, you enter and manipulate text and have access to the Graphics menu for drawing, importing images, and working in a graphics frame. There's also a Draft Edit mode, which handles only text. In the program's Frame mode, you can create and manipulate frames containing graphic elements, tables, EPS graphics, and text frames. In Page Editor mode, you may type in text; work with graphics, data, and tables; or run the spelling and grammar checkers.

If all the text and graphics editing capabilities of WordStar for Windows worked together smoothly, this word processor would be formidable competition for other products that already have simplified layout procedures by allowing text and graphics to be manipulated within the same mode. You can link stories across multiple pages so that text flows forward to the next frame. Likewise, you can link graphics and tables if they are too large to fit on one page. WordStar automatically wraps text around graphic elements.

The program imports bit-mapped images at their original size and can scale them to fit the graphics frame only when you are working in the Frame mode or when you access the Layout commands. WordStar switches automatically to Frame mode when you select the Scaling option. The package can import a variety of graphics file formats.

Unfortunately, WordStar's ability to handle text and graphics on the same page is poor. Highlighting three columns of text is very difficult, and the program redraws the screen frequently and generally acts erratically. After reformatting an area of text, small highlighted sections may still remain. To deselect them, you must repeatedly click in these highlighted areas until they no longer are marked. You may even have to redraw the screen to eradicate them.

We encountered one minor annoyance in working with the program. Using the Save As option to save a file to a floppy disk when you already have saved it during your current computing session almost always mysteriously produces an error message indicating that the file already is open and can't be accessed. When this happens, you have to return to the File menu and use Save instead.

WordStar for Windows wants to join the ranks of desktop publishers. Its learning curve may be steep, and it can be tricky keeping track of modes and all the different pointers and markers. But once you've reordered your way of thinking, you should be able to use WordStar to produce crisp-looking output.

MACINTOSH PROGRAMS



SUMMARY

MACWRITE II 1.1

PROS Fast, responsive; easy to use; uncluttered interface; great price

CONS Inflexible columns; indirect graphics scaling

MACWRITE II 1.1

As a straight-ahead word processor, it's hard to beat this classic. It's fast, has a clean interface, is easy to use, and is very stable. What it's not is a flexible document designer.

You can set up a multicolumn page easily enough. (All layout commands are issued through dialog boxes. Settings such as line spacing, tabs, and justification can be controlled through icons below the ruler at the top of the screen.) But MacWrite wouldn't let us construct our complete test document, which calls for a full-width banner headline on the first page. If you choose a three-column page layout, the entire page must have three columns. You can't set up an area that deviates from that. You can get a page-wide column at the top by setting up a header, but that header will appear on every page. You can't have it appear only on the first page, which is what you'd probably want with a newsletter or brochure. If there's a way to have one big column hovering over multiple columns, the manual doesn't reveal it. This is an unfortunate limitation, even for the user who's not partial to complex page designs.

Although MacWrite doesn't always let you have what you want, it does generate output that matches what you see on the screen. A line that's 2 inches on the screen is 2 inches on the printed page, for

example. Imported images, however, sometimes turn out streaked on a printout.

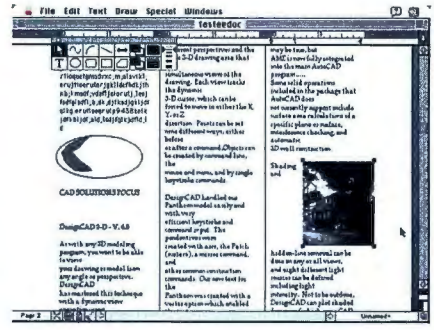
MacWrite II is good at bringing in graphics. You can import PICT or MacPaint images through the Clipboard, or you can bypass copying and pasting by choosing the Insert File menu. The program plops the graphic at the point where the cursor sits. You then can move it as if it were a text character, by adding spaces with the spacebar, or by clicking on it and moving it like an object. If you need to scale an image, you type the appropriate values into a dialog box. This isn't as easy clicking on an image's handles and enlarging or reducing the image, but it works.

MacWrite II does not have the button bars of some of its competitors; instead, you change fonts and type sizes and styles through menus. Other operations, such as building tables, are accomplished through dialog boxes. The interface looks refreshingly plain when compared to the front ends of Word and WordPerfect.

MacWrite II is a fine text editor that's easy to learn, packs all the text-manipulation tools you expect from a word processor, and includes all the things a writer needs: a 100,000-word dictionary, 220,000-word thesaurus, and spelling checker that does word counts. Claris says MacWrite can handle documents with as many as 1000 pages (We've used it with a 150-page manuscript and encountered no problems except slow file loading). Other pluses are mail-merge capability, ease of setting up form letters, painless footnoting, and the speed with which it scrolls through a page. Claris' translation filters let you pull in text from just about any Mac program. You can take a file written in Word, for example, pull it into MacWrite to edit it, then ship it back to Word.

Right now, the program can't do flexible page layout, but all this could change with the new "professional" version of MacWrite, due out sometime soon. While we'd hate to see old friend MacWrite get bogged down in featuritis, it would be nice if Claris fixed the program's inflexible, one-style-fits-all column structure. In anticipation of the new release, Claris has reduced MacWrite's price by half to $129, making this one of the best bargains in Mac software.

If you want to pour your text into fancy pages, without firing up PageMaker or FrameMaker, MacWrite II will frustrate you. On the other hand, if your main editing job is flowing text and a few graphic elements onto a multicolumn page, MacWrite will do you fine.



BYTE LAB PRODUCT REPORT

SUMMARY

TASTE 1.02C

PROS Strong page-layout functions; easy to use; includes drawing tools; permits different layouts on facing pages; good price

CONS Forces you to switch between editing and drawing modes; inconsistent word wrapping

TASTE 1.02C

DeltaPoint's Taste is a mixture of word processor and desktop publisher. The package handles simple word processing tasks well, but feels more like a DTP package.

With Taste, you set up your document's layout by specifying margins and column widths in a dialog box or by sliding markers on a graphical representation of a page. This setup makes it easy to create multiple columns like the ones in our newsletter. from this layout mode, you also can set up such things as space for a banner headline (what many word processors call a header). The template you establish may be applied to any or all pages in your document. Taste lets you set up different layouts for facing pages. Making changes to your page layout is easy.

To get text into your document, you can type it right on the page or pull it in from another word processor. The program can import ASCII text or files from other Mac word processors. Because the package comes with Claris' file translators, it can handle just about any foreign file format. As a text editor, Taste is responsive.

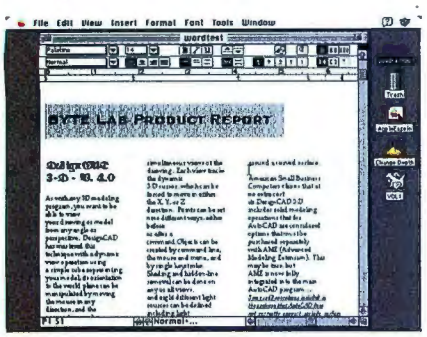
Taste includes a set of basic drawing tools similar to the ones you'd find in PageMaker for generating geometric forms. These tools are good for putting boxes around text and adding horizontal rules, shaded areas, and arrows, but the polygon-, curve-, and arc-drawing pens let you create even free-form graphics. Taste can import images in PICT or EPSF format, but not those in TIFF format.

All graphics work is done in Taste's drawing mode, which you hop into by clicking an icon at the bottom of the screen. Taste handles graphics as objects, so you can pick them up to move them, resize them, and generally manipulate them with ease. If you've used any object-based art packages, you'll get the hang of drawing mode immediately. You also can work with text within the drawing layer, which makes this a good place to work while putting together banner headlines and logos. The program treats the text in this layer the way it treats a graphic: as an object. Once you have the graphic the way you want it, you click back into text mode and the graphic is placed on the page.

As you'd expect from a good desktop publisher, Taste will let you wrap text around or inside a graphic. You simply select the graphic, then click on the "wrap around" or "wrap inside" command. This is easy enough, but the action is inconsistent. We frequently hit snags with this operation, with the text refusing to wrap text around the sides of an image. Instead, it stops flowing at the top of the image's boundary, then begins again at the bottom of the image, leaving white space on the sides of the graphic instead of flowing the text. The automatic wrap, when it does work, is limited to graphics generated in Taste; with imported graphics, you have to go in and add or remove spaces, or you can trace the imported image and turn it into a Taste graphic. This can be done, but the process isn't pretty.

Formatting text with Taste works much like it does with most other Mac word processors. You can select a chunk of text and set attributes such as font choice and type size, or you can set up style sheets that automatically do the formatting. Taste has the usual selection of type styles, including two that some of the others don't: boxed and redlined. In addition, the package lets you adjust the spacing between letters (kerning) and can handle type sizes as large as 127 points.

The program has the tools a writer needs, including a word counter, spelling checker, dictionary, thesaurus, automatic numbering of footnotes, automatic page numbering, hyphenation, and a page-preview mode from which you can make changes. It is an ideal package for the person who has to write and design documents. If the material you write often gets poured into a page-layout program, you can save some time, effort, and money with Taste.



SUMMARY

MICROSOFT WORD 5.0

PROS Ribbon bar provides easy access to operations; robust editing tools; drag-and-drop capability; Equations Editor; System 7.0 savvy

CONS Exhibits irregularities when adding graphics; mixing layout styles isn't easy; scrolling can be slow

MICROSOFT WORD 5.0 FOR THE MACINTOSH

This newest version of the big gun in Mac word processors makes it easier to manipulate text. The program is now more visually intuitive and probably easier to get around in than Word 4.0 was. Like Word for Windows, Word for the Macintosh now has a formatting bar, called a ribbon, across the top of the screen. This horizontal ribbon holds icons and menus representing the most frequently used functions. Here you can quickly access commands and options with a single click. The font menu, type sizes, styles (boldface, italics, and so on), and column formats all reside in this ribbon. If you do a lot of experimentation on the page with type styles and sizes, this formatting ribbon can save you a lot of time and many mouse-clicks.

In terms of editing operations, the biggest change to Word is its ability to drag and drop text. This capability, introduced in the latest Word for Windows, lets you select a block of text, move the cursor to the place you want it to go, and release the mouse button to drop the text at its new location. This is far more efficient than copying, cutting, and pasting. If you work on documents that often involve rearranging text, drag and drop can be a big time-saver.

As a program for setting up documents such as our test newsletter, Word 5.0 works well. It lets you do everything necessary to generate a multicolumn page with mixed type styles. With this new version, you're no longer limited to a type size of 128 points; Word 5.0 can handle type as big as 16,000 points, which you'll probably never need unless you're editing a billboard.

Mixing layout styles isn't as easy as it is with Taste, but Word can do it. If you want to vary a section of your page—inserting a two-column text box on the three-column page, for instance—you have to set up a frame using a dialog box. You can place graphics or text in a frame; however, the procedure for implementing frames is not intuitive. Expect to spend some time with the manual.

While Word 5.0 has all the graphics functions you'd need for designing a good-looking document, we ran into snags with this part of the program. Images did not always paste in the way we expected. Sometimes we'd get only part of the image, surrounded by a big frame. Scaling the image by manipulating its handles would redraw the image properly only some of the time. And although the documentation says you can drag and drop images, we couldn't always get the image to snap into its new location. These graphics-related malfunctions are frustrating; let's hope they're bugs that get fixed in 5.1.

If your documents often require mathematical formulas, you'll appreciate the Equations Editor in Word 5.0. It's adapted from Design Science's Math-Type program. While you could do complex equations before, with Word's typesetting language, it's much easier with the new editor. Most of the work in setting up an equation may be done by clicking on choices in a palette of symbols.

Like the new WordPerfect, Word 5.0 is a strong System 7.0 application. It takes advantage of Publish/Subscribe, so you can set up links with other Mac programs that take advantage of this feature.

As a text editor, Word is excellent. It's got all the tools a writer needs, including a spelling checker, grammar checker, outliner, indexer, and automatic table-of-contents generator. Word also can handle all the tasks involved in setting up complex pages. It may not do this as intuitively as some other programs, but it will get the job done. Our only concern is with the graphics-manipulation functions. They require some time to learn, and they don't always work as expected.

Word users are pretty much Word users for life. Our opinion isn't likely to sway anyone to try another program. But we will offer some advice about upgrading. Buy the upgrade to version 5.0 ($129) if you need System 7.0 functions and inter-application connections, or if you want such features as the ribbon bar and drag-and-drop operations.

If you're looking for your first Mac word processor, you really can't go wrong with Word. It's a good, intuitive text editor. And it's backed by a company that you can bet is going to be around for a while.



SUMMARY

WORDPERFECT MACINTOSH 2.1

PROS Packed with tools; push-button controls; lets you embed QuickTime movies; System 7.0 savvy

CONS Problems flowing text; requires you to switch between editing and drawing modes

WORDPERFECT MACINTOSH 2.1

With this latest version, WordPerfect has bestowed System 7.0 savvy on an already feature-laden word processor. The program now can connect with other Mac applications through Publish/Subscribe and support for Apple Events.

But the neatest trick this pony now does is work with QuickTime, Apple's operating system extension for handling multimedia data, such as video and audio sequences. With QuickTime support, you can embed frames of moving video in your WordPerfect document. Movies can be a part of your page. This is the first word processor that can handle QuickTime files.

WordPerfect is a top-of-the-line word processor when it comes to supplying all the tools a writer needs: variable type styles and a dictionary, thesaurus, spelling checker, indexer, and word counter. Formatting text and pages is relatively easy, and most operations are available from the ruler at the top of the

page. Like Word, WordPerfect has push-button controls; you click on an icon to set the type of columns you want, the number of columns, the way the text aligns, and so on. You can change column widths either by sliding markers along the ruler or by setting specifications through the Page Format menu and dialog boxes. (The latter approach is more precise.) You set up style sheets the way you would in other WYSIWYG word processors or in DTP packages, by specifying type sizes, fonts, indents, headings, and so on in menus and dialog boxes.

Getting graphics onto the page is relatively simple. WordPerfect can pull in most common formats, either by copying them and pasting them in or through the Insert menu. Once you've got the image in your document, you can move or resize it by pushing or pulling handles. You also can anchor a graphic to a particular page or paragraph, which is helpful if you want to keep an image next to some text associated with it.

WordPerfect says the program will automatically wrap text around a graphic, but this function didn't operate consistently. Sometimes the text runs right across the image; at others, it bumps right against it. You can go in and manually insert spaces to make things look OK, but this is hardly automatic word wrapping.

This failure to do as it's told is a serious problem with WordPerfect 2.1—so much so that we had difficulty generating our test document. When we poured text into a three-column layout, for example, the text sometimes flowed across the width of the page, ignoring column boundaries. Other times, the text smashed into graphic elements or just disappeared. But we can say this: The program definitely is WYSIWYG. When text got jumbled on the screen, it came out jumbled when printed.

These problems didn't come up when working with a one-column page that was mostly text. So, if your documents are rather plain memos, reports, or books, WordPerfect is fine. If most of what you write requires multicolumn pages that contain graphics, be prepared to go in and do some twiddling.

We expected to find snags in the QuickTime components, since that's such a new technology. But that part of the program worked flawlessly. You insert a movie clip the way you would a still image. Once the frames are on the page, you can pick them up and move them around like any other graphic. You also can resize the video frames the way you would any scalable static image.

QuickTime technology is a harbinger of documents of the future. Imagine embedding scalable video frames in your next newsletter or company brochure. Imagine sending someone a letter terminating a contract or relationship; at the bottom of the letter is a QuickTime frame taken from a popular science fiction film; the recipient clicks on the frame and the image comes alive: "Hasta la vista, baby."

What You Want Is What You Buy

If you want visually appealing, professional-looking documents, without any surprises when you print, you need a WYSIWYG package. For the multitudes of users moving to or starting out with a graphical interface, WYSIWYG makes perfect sense. New users will find it a lot easier to get down to editing and formatting text with a graphical program. Managers at corporate installations agree that novices can be producing documents in much less time with a GUI editor than with the old command-line kings such as WordPerfect and WordStar. Training is not a trivial issue.

For Windows users who don't already have a faithful word processor, we recommend—after grueling debate—Microsoft Word or Ami Pro. We say grueling debate because both packages have staunch advocates here. Word has a very slight edge with its interface, its drag-and-drop editing style, its simple customization of menus and icons, its ease of importing text and graphics in a variety of formats, and its superior documentation. Picking between these two is a highly subjective decision only you can make. Ami Pro certainly is no less capable than Word. It can do anything Word can do. And, due to its Windows heritage, it felt more stable and more responsive to some of us. We highly recommend that you not buy either without taking a test drive.

WordPerfect 2.1 is one of the top two Mac word processors. It will let you produce some sophisticated-looking pages, and it has all the power tools a writer could need. It has a macro language and exploits System 7.0, and it can handle any kind of document, from newsletter to book-length manuscript. On top of that, its innovative support for QuickTime movies is the coolest thing added to a mainstream Mac application this year. But the program sometimes misbehaves when flowing text or working with graphics. When WordPerfect fixes these flaws, we can recommend WordPerfect for the Mac without reservation.

Word 5.0 cruises along like a breeze during most writing and editing jobs. It's fast and responsive. The push buttons at the top of the screen let you do most editing and formatting operations without having to thumb through menus or work through dialog boxes. Although it's no replacement for a page-layout package, Word 5.0 can handle fairly complex page designs. It supports all the deluxe System 7.0 capabilities. And it's used by tons of Mac owners, so if you run into a problem, you can find help. As a writing and editing toolkit for the kinds of writing most people do, Word 5.0 is the one. ■

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DeScribe, Inc.
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Sacramento, CA 95834-9954
(916) 646-1111
Circle 1107 on Inquiry Card.

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Circle 1108 on Inquiry Card.

Microsoft Corp.
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Circle 1109 on Inquiry Card.

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HARDWARE

Color at a Reasonable Price

TOM THOMPSON



Most wine grows finer with time. The same maxim applies to color PostScript printers: They've definitely improved over the years. The first color PostScript printer was QMS's ColorScript 100, introduced in 1988. It was a big 112-pound beast that was so slow that some scanned images took up to 45 minutes to print. The output was nothing to write home about, but the colors made the printed pages stand out far more than any black-and-white output from a conventional laser printer. QMS asked—and got—$25,000 for its printer.

Today, you have a choice of color PostScript printers that are loaded with features and impressive speed. More important, many are priced under $8000. These printers achieve their low cost through the use of thermal-wax-transfer technology—the same technology as in the ColorScript 100. (For more information on how thermal-wax transfer works, see the text box "Hot Wax" on page 320.)

The BYTE Lab evaluated seven thermal-wax printers that fall in the under-$8000 price class: Tektronix's Phaser II PXi, Brother International's HT-500PS, Seiko Instruments' ColorPoint PS, NEC Technologies' ColorMate PS Model 40, Océ Graphics' G5241-PS/4, CalComp Computer Graphics Group's ColorMaster Plus 6603PS, and General Parametrics' Spectra*Star Model 430.

All these printers work with either a Macintosh or a PC. Most have three I/O ports—a LocalTalk network connector, a Centronics parallel port, and a serial port—that facilitate connections to any desktop computer. The exceptions to this arrangement are Seiko's ColorPoint PS, which comes standard with only a parallel port, and Océ's G5241-PS/4, whose one DB-9 connector does double duty as a serial and LocalTalk port.

Many of these printers also have a 50-pin SCSI connector that's used to hook up a hard drive to the printer. The hard drive stores outline fonts and caches bitmapped fonts the printer creates during a print job. This setup saves time: Rather than tying up your computer with downloading different fonts to the printer as it demands them, the printer has to go only as far as the hard drive to obtain the fonts it needs. The exception here is General Parametrics' Spectra*Star Model 430, which doesn't have a SCSI port.

In terms of software support, most vendors supply the appropriate printer drivers. For the Mac, this is a modified LaserWriter driver: Usually, resources are added that support the special page-size areas these printers use. For Windows, you use either the standard Windows PostScript driver or a modified one that's supplied on a floppy disk.

The printers range in weight from the lightweight 39-pound ColorPoint PS to Tektronix's hefty Phaser II PXi. At 73 pounds, it takes two people to carry it.

Both the NEC ColorMate PS Model 40 and the CalComp ColorMaster Plus 6603PS angle their input and output paper trays vertically for a smaller desktop footprint. The other printers have paper trays that jut out from the side, take up room, and set up the situation to bang a passing hip if the tray happens to protrude into a high-traffic area.

Although all seven printers use the PostScript language to create output, only three of them use Adobe interpreters. The rest of the printers use PostScript clones, with two of the four using the PhoenixPage interpreter. All the printers have an output resolution of 300 dots per inch. (See the table for a complete list of printer features.)

Put to the Test

In addition to output quality, an important review factor for these printers is performance. A printer should be able to produce gorgeous results without taking inordinate amounts of time doing it.

Measuring printer performance can be tricky, however. If a printer is slow, is it the result of the application that's printing the page, the printer driver, the network, the printer's PostScript interpreter, the print engine, or a combination of all the above?

There are ways to minimize the interaction of these components of the printing process. I eliminated network overhead by printing from the parallel port of a 12-MHz 286 PC. Next, I took a 2.5-

PHOTOGRAPHY: SCOTT PARKER / AVIS STUDIO © 1992



BYTE ACTION SUMMARY

- **WHAT THERMAL-WAX-TRANSFER PRINTERS DO**
  These printers use PostScript and thermal-wax transfer to produce three- or four-color images.
- **LIKES**
  They are easy to set up and faster than other color-printer technologies in this price range.
- **DISLIKES**
  The special paper that they require for the wax to properly adhere to a page drives up printing costs. The wax-based pigments can be easily scratched and are prone to flaking off the page.
- **RECOMMENDATIONS**
  For high performance and high quality, Tektronix's Phaser II PXi is the way to go, with a fast RISC processor and good dithering algorithms. For higher speed at lower cost, but at the expense of image quality, consider NEC's ColorMate PS Model 40. For better image quality at the expense of performance, check out CalComp's ColorMaster Plus 6603PS.
- **PRICE**
  Brother HT-500PS, $4995
  CalComp ColorMaster Plus 6603PS, $5495
  General Parametrics Spectra*Star Model 430, $6995
  NEC ColorMate PS Model 40, $5899
  Océ Graphics G5241-PS/4, $6990
  Seiko ColorPoint PS, $4999
  Tektronix Phaser II PXi, $7995

MB Mac PageMaker 4.2 document with a mixture of text, Adobe Illustrator 3.2 graphics, and TIFF images and printed it to disk as a PostScript file. I did the same thing with a 2.75-MB scanned image in Adobe Photoshop 2.0 and a 198-KB CorelDraw 2.01L drawing.

I downloaded the PageMaker document from a Mac Quadra 900 on an isolated LocalTalk network consisting of just the Mac and the printer; the Photoshop document was downloaded from the PC. I measured the times from the start of the jobs until the pages were ejected from the printers. These setups minimized the effects of the application overhead, other than those caused by the application doing the download.

To measure the processing speed of the PostScript interpreter, I cobbled together code fragments into a 9-KB PostScript program. The code did some gray-level dithering with text outlines, rotated text and colored the characters various hues, and then drew a color wheel that spanned the color gamut. At the wheel's rim, I placed some text that was defined as a *clipping path*. I wasn't attempting to exercise every PostScript operator, but to perform a subset of operations that an art or page-layout application might occasionally use. Each test was timed by using the PostScript operator `usertime`.

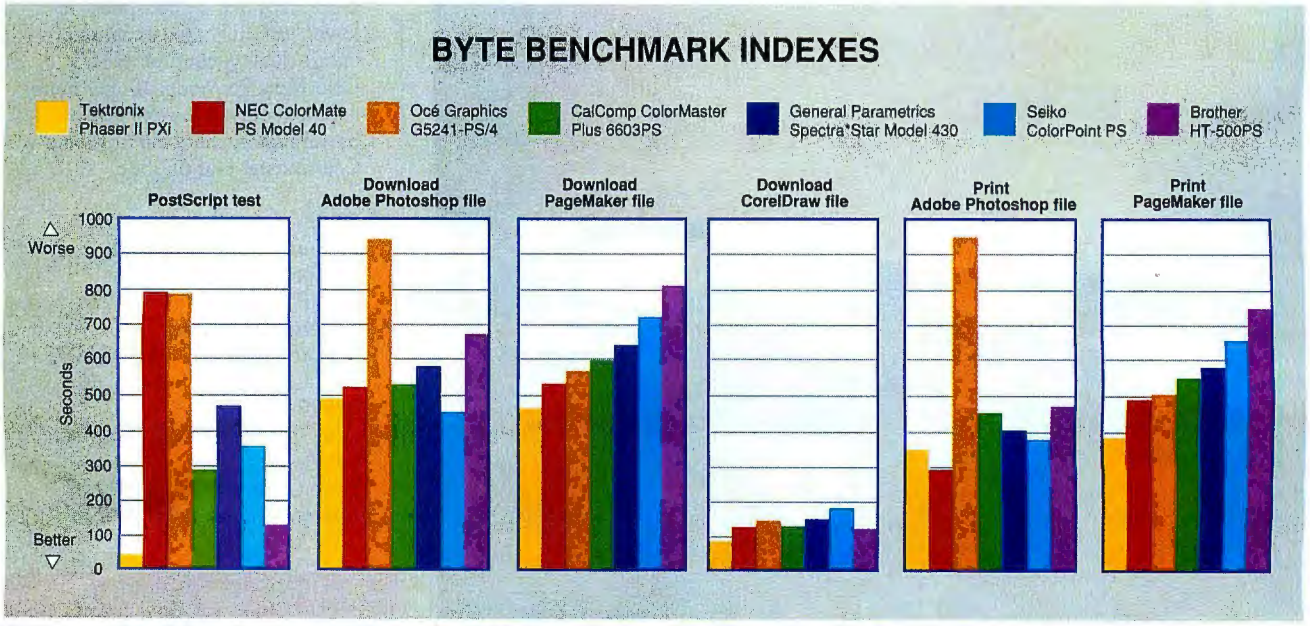
Finally, because I normally don't save the output to a PostScript file and download it, I printed the PageMaker file and the Photoshop file from within their respective applications on the Quadra 900. The results are shown in the figure.

COLOR POSTSCRIPT THERMAL-WAX-TRANSFER PRINTERS

Color printer features. Colors indicate the types of ink ribbons the printer can use. Pantone licensing is important for those who need precise color matching.

Printer	Processor	RAM min./max.	Graphics modes	PostScript interpreter	Ports	Auto-port-switching	Colors	Resident fonts	Pantone-licensed
Brother HT-500PS	60-MHz 34010	5 MB/21 MB	PostScript, HPGL, HP-PCL4	BR-Script	LocalTalk (DIN-8), parallel, serial (DB-25), SCSI[1], external I/O	Yes	1, 3, 4	11	No
CalComp ColorMaster Plus 6603PS	16-MHz 960	6 MB/34 MB	PostScript	PhoenixPage	LocalTalk (DIN-8), parallel, serial (DB-25), SCSI	Yes	1, 3, 4	39	Yes
General Parametrics Spectra*Star Model 430	20-MHz 960	6 MB	PostScript, HPGL, Mitsubishi G370-10	SpectraStar PS	LocalTalk (DIN-8), parallel, serial (DB-25), "Satellite"	Yes	1, 3, 4	35	Yes
NEC ColorMate PS Model 40	16-MHz 68020	4 MB/8 MB	PostScript	Adobe level 1	LocalTalk (DIN-8)[2], parallel, serial (DB-25), SCSI	No	1, 3, 4	17	Yes
Océ Graphics G5241-PS/4	16-MHz 68020	4 MB/8 MB	PostScript	Adobe level 1	LocalTalk (DB-9), parallel, serial (DB-9)[3], SCSI	No	1, 3, 4	35	Yes
Seiko ColorPoint PS	16-MHz 960	6 MB/22 MB	PostScript, HPGL	PhoenixPage	LocalTalk (DIN-8)[4], parallel, serial (DB-9)[4], SCSI (DB-25)[4]	Yes	1, 3, 4	39	Yes
Tektronix Phaser II PXi	24-MHz AMD 29000	8 MB/18 MB	PostScript, HPGL	Adobe level 2	LocalTalk (DIN-8), parallel, serial (DB-25), SCSI	Yes	1, 3, 4	39	Yes

[1] Miniature delta ribbon connector. [2] Also serves as RS-422 serial port. [3] LocalTalk and serial share same connector. [4] Optional.



Timing results of the printers at various tasks. With the exception of the Photoshop file downloading and printing, the Tektronix Phaser II PXi was the fastest printer.

These printers are definitely faster than the four-year-old ColorScript 100, knocking out a scanned-image print in 6 to 15 minutes. The real speed demon is the Tektronix Phaser II PXi, thanks to its 24-MHz AMD 29000 RISC processor that powers a PostScript level 2 interpreter. Compared to the Phaser II PXi, it's a mixed bag as to which printers fared better on the various tests.

Interestingly, the two printers with Adobe level 1 interpreters—the NEC ColorMate PS Model 40 and the Océ G5241-PS/4—came in last on the PostScript benchmark test. My guess is that the problem lies in the use of a clipping path using text outlines. This was something that gave me trouble earlier on these printers and required a revision in the benchmark code.

However, both of these printers fared well on the PageMaker tests. Note that the G5241-PS/4 handled Photoshop's large color bit maps poorly, whether the file was received as a download through the parallel port or printed from the application via LocalTalk. What follows are short personal impressions—from a user's standpoint—of the seven thermal-wax-transfer color printers under review.

Page size	Weight	Price
A, legal	65 lbs. (29.5 kg)	$4995
A, A4	55 lbs. (25 kg)	$5495
A, A4, A4 special, legal	72 lbs. (32.5 kg)	$6995
A, A4	55 lbs. (25 kg)	$5899
A, A4	45 lbs. (21 kg)	$6990
A, A4, legal	39 lbs. (18 kg)	$4995
A, A4, A4 special, legal	73 lbs. (33 kg)	$7995



Brother International HT-500PS

This blocky unit has an LCD panel that provides a wealth of information: medium type, paper size, emulation mode, number of inks on the ribbon, and more. It also displays an exhaustive set of error messages, including buffer overflow, ignored data, and memory full—handy stuff to know when your print job inexplicably conks out. An audible alarm warns you of an error, including the all-too-often out-of-paper situation. The front panel also has an intimidating bevy of buttons and indicator lights. You can remove the back panel—I/O connectors and all—to add more SIMM RAM. RAM can be expanded from 5 to 21 MB.

The HT-500PS has the standard three I/O ports and a SCSI connector, with port-switching logic. The SCSI connector is not the standard 50-pin type, but rather a miniature delta ribbon connector. Upon request, Brother will provide an adapter cable that allows you to connect conventional SCSI drives. An external I/O port with an optional I/O board lets you proof output on a Hewlett-Packard LaserJet or other black-and-white printer.



CalComp Computer Graphics Group ColorMaster Plus 6603PS

If the name doesn't clue you in, one look at this printer lets you know that it's made by the folks who brought you computer plotters over the years. It's a solidly built machine.

It also has nice touches, like a locking latch that holds the cover open when you're changing the ribbon and a medium-loading arm that either moves the tray back so you can load it with paper or moves it forward to hold the paper snug against the feed rollers. As with the NEC ColorMate PS Model 40, angled vertical trays reduce the ColorMaster Plus 6603PS's desktop footprint, although the printer is as deep as Seiko's ColorPoint PS, including its out-jutting receiving tray.

The six-button front panel with arrow keys lets you move easily through the setup menus. The LCD screen provides useful information, such as processing messages and the number of copies that have been printed. In the back, the ColorMaster Plus 6603PS has the standard I/O ports that use automatic port-switching.

Although the printer has two 50-pin SCSI connectors in the back, hinting that the printer might operate as a SCSI peripheral, this is, sadly, not the case. There's no SCSI printer driver available, and the manual states that the printer isn't capable of being a SCSI peripheral. This is too bad, since the SCSI port would make a good high-speed connection for big color jobs.

In terms of performance, the ColorMaster Plus 6603PS landed in the middle of the pack. On graphics, it seemed to do a good job on color dithering, placing second in appearance behind the Phaser II PXi.



General Parametrics Spectra*Star Model 430

This printer has a squat, Spartan design and resembles a small refrigerator. It has a good, verbose LCD screen. While the printer is idle, the display rotates through the printer's current settings (e.g., page size and emulation mode). It also authoritatively states that it's receiving and processing data during a print job. The six-button front panel is easy to understand, and the two arrow buttons help you to navigate through the setup menus easily.

The Spectra*Star Model 430 can sense incoming data on any of the I/O ports and receive data on the active port if the printer's hardware time-out is set. For certain print jobs, the processor can become so busy that you intermittently lose contact with the printer. This problem is documented in the manual, which also includes some suggested remedies. For instance, you can set the transmission retries to a large value (for Windows applications) or reconfigure the printer for the high-quality mode rather than the enhanced-quality mode (for Mac PageMaker 4.0).

This information really came in handy because it was necessary for me to change the printer settings as described in the manual to print the PageMaker test document from the Quadra 900. The Spectra*Star Model 430 had no difficulty printing the large Photoshop file later, however.

continued

Hot Wax

Although many printing technologies can produce color output, the chief advantage of thermal-wax transfer is that the procedure is simple and doesn't require liquids or toxic chemicals. The heart of the process is a transfer ribbon impregnated with wax-based colored inks. Inks of cyan, yellow, magenta, and sometimes black—the process colors—are laid out in a repeating sequence of page-size panels along the ribbon.

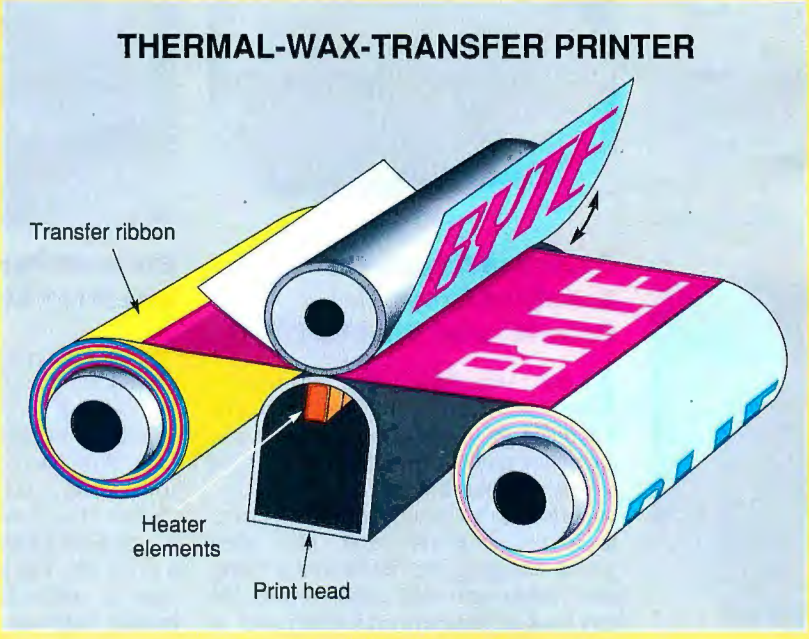
At the start of a job, the printer pulls in a page of paper. Rollers sandwich the ribbon between the paper and a print head that contains thousands of precisely controlled, minuscule heating elements (see the figure). As the paper and ribbon travel along the print head, certain elements heat up, melting dots of pigment onto the paper. These elements switch on or off, depending on the image's color information at that section on the page. The print head is as wide as the paper, so it can place the entire image onto the page as the paper advances.

This pass lays down one color. To add the other colors, the paper must be shuttled back and forth across the print head again. Each time, a different color panel is brought into contact with the paper, and its pigment is layered onto the other colors.

As you might expect, there are some disadvantages to this process. First, building the image a layer at a time is slow. Still, this process is faster than color ink-jet printers, where a print head must wipe back and forth across a page, assembling the image a strip at a time. Since a page must make three or four passes over the print head, paper alignment is crucial. If misregistration of the page—and, hence, the colors—occurs, the image is ruined.

In some situations, the transfer process can be wasteful. For example, if you're printing a PageMaker document with some magenta-colored text on the page, whether or not the paper requires the other hues, they get pulled through the printing mechanism. Also, the wax pigments are soft and easily scratched. For the wax to adhere properly, a special paper must be used, driving up the printing cost. The average cost per page is about 50 cents.

Nevertheless, this is far cheaper than other color-printing technologies, such as dye sublimation or color laser. Thus, the mid-range color-printer market is dominated by thermal-wax-transfer printers.



All thermal-wax-transfer printers work by heating colored wax (cyan, magenta, yellow, and black) and fusing it to a special paper. The print head melts tiny dots of color from a ribbon onto the paper. The paper must make four passes by the ribbon and heating element—one pass for each of the four colors.



NEC Technologies ColorMate PS Model 40

This printer has a sleek wedge-shaped design. The trays for paper and output are angled along the back of the wedge, giving the printer the smallest desktop footprint of the group. A thumb wheel at the front lets you easily adjust the ink intensity.

The four-button front panel with an LCD screen has been simplified to the point of being user-hostile. After several minutes of poking at the switches, I gave up and cracked the manual. Since the printer does not auto-sense for an active printer port, you must configure the active I/O port through this unfriendly front panel. In its favor, the display prompts you to verify whether you really want to abort a print job, in case you have hit the controls accidentally.

The ColorMate PS Model 40's back panel can be easily removed to add an extra 4 MB of RAM and 18 more ROM-resident fonts. In spite of the printer's low marks on the PostScript benchmark, it performed well on other printing tasks. As the benchmark figure shows, it was one of the fastest printers in the review group, beaten only by the Phaser II PXi.

continued

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Océ Graphics G5241-PS/4

This printer looks like Darth Vader's telephone with its rounded upper housing. There's a good design reason for that curved top: It holds the ink ribbons, making ribbon replacement easy. After the Seiko ColorPoint PS, this is the lightest printer in the group.

It has the standard I/O ports, but the LocalTalk port uses an ancient DB-9 connector instead of a modern DIN-8. The reason behind this connector choice is that the port also doubles as the serial port. However, if you need access to a LocalTalk network, you're going to have to track down an old-style DB-9 network node to make the connection. The printer has no automatic port-switching; you have to set that up on the front panel.

For scanned images that covered most of a page, the G5241-PS/4 occasionally wrinkled the top portion of the paper. It didn't damage the wax layers, but the wrinkles didn't do much for the page's appearance.



Seiko Instruments ColorPoint PS

The ColorPoint PS has a low-slung design that's marred by a receiving tray that juts out from the base. There are three slot panels at the rear. The bottom slot has a standard parallel port, and this is the basic hardware configuration. The middle slot is for an optional multiport board with a DB-9 serial, a DIN-8 LocalTalk, and a second parallel port. The top slot holds extra RAM, so you can expand memory from 6 to 22 MB.

Like the HT-500PS, it has an audible alarm signal that can be shut off from the front panel. The LCD panel has decent, informative messages. Flipping up a cover reveals a maze of arrow keys and no fewer than 16 buttons that serve as numeric keypad, function keys, and menu selection. Most of the time, you'll leave the entire setup alone except for using the arrow keys to walk through the printer's configuration menus.



Tektronix Phaser II PXi

Considering the different configurations of the button/LCD panels on the six other printers I tested for this review, it was interesting to see that the Phaser II PXi did not have such a panel. Instead, there are seven LEDs that indicate power, printer ready, error, paper jam, ink ribbon, cover open, and paper out. The ready light blinks as the Phaser II PXi reels in data.

The usual three I/O ports and SCSI connector are located in the back, along with quite a few DIP switches that you would mostly use to force a hardware reset or set the serial-port speed to a fixed 1200 bps. As with the HT-500PS, this back panel comes off so that you can add SIMM RAM.

The Phaser II PXi uses Adobe level 2 PostScript. As the benchmarks show, this printer was clearly the fastest in most categories, with the exception of the Photoshop print and download. Perhaps most important, the printer's output was a winner as well: Tektronix has spent many research dollars on color dithering technology, and it shows. The dithering of the scanned images and the color wheel are about the best that the BYTE Lab has seen.

Rainbow's End

Color printing has certainly improved in the past several years. Simply put, the output looks a lot better. Scanned images appear less muddy and less flat than those that were produced with older printers. Printing performance has improved, too: Even the slowest printer in this review group produced output several times faster than the now-ancient ColorScript 100.

But there is still room for improvement. The wax-based inks on paper are prone to scratches and flaking, so it's not likely that you'd use these printers to print a color newsletter. Instead, most of these printers will find homes in design shops or in advertising agencies, where their output will be used only to proof the color artwork and other color items that are destined for final printing in books, magazines, and other press-printed material.

Pantone-licensed printers, with the appropriate software, also allow you to fine-tune the colors in your output. This gives you a close approximation of how the final output will look.

In this situation, the frailness of the wax pigments isn't an issue. What's important is that your printer's output allows you to catch glitches or mistakes before you send a file to be printed on a typesetter. Even at 50 cents per page, a thermal-wax-transfer printer reduces costs by keeping expensive errors to a minimum. In addition, these printers are also good for creating overhead transparencies for business presentations.

My runner-up choices are NEC's ColorMate PS Model 40 and CalComp's ColorMaster Plus 6603PS. The ColorMate PS Model 40 did well in the benchmark tests and costs less than the Phaser II PXi. However, its output quality is not up to that of the Phaser II PXi, and its front-panel design is awkward.

The ColorMaster Plus 6603PS has a middle-of-the-road performance and a middle-of-the-road price tag. The machine is built like a tank, and its output quality is better than that of the ColorMate PS Model 40. For those who relish the appearance of their output, the ColorMaster Plus 6603PS is the better choice.

But my personal favorite is Tektronix's Phaser II PXi. It's fast, and the company's dithering algorithms result in less-grainy scanned images and more

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precisely toned colors in artwork. The front panel is uncluttered and simple, but you have to remember to position the slider to the appropriate medium (i.e., paper or transparency) before printing. It's one of the pricier printers I tested, but its speed and results well justify the additional cost. ■

Editor's note: *Shortly before this article went to press, Tektronix introduced its new Phaser II PXe, a thermal-wax-transfer printer for $4995. The Phaser II PXe is nearly identical to the Phaser II PXi just reviewed here, but its lower price is achieved by using a 16-MHz AMD 29000 processor. Also, maximum memory is limited to 8 MB, and the SCSI port is absent.*

Tom Thompson is a BYTE senior technical editor at large. He has a B.S.E.E. from Memphis State University. Contact him on BIX as "tom_thompson" or on AppleLink as "T.THOMPSON."

COMPANY INFORMATION

Brother International Corp.
(HT-500PS)
200 Cottontail Lane
Somerset, NJ 08875
(908) 356-8880 ext. 4300
fax: (908) 469-4415
Circle 1131 on Inquiry Card.

CalComp Computer Graphics Group
(ColorMaster Plus 6603PS)
2411 West La Palma Ave.
Anaheim, CA 92801
(714) 821-2000
Circle 1132 on Inquiry Card.

General Parametrics Corp.
(Spectra*Star Model 430)
1250 Ninth St.
Berkeley, CA 94710
(510) 524-3950
fax: (510) 524-9954
Circle 1133 on Inquiry Card.

NEC Technologies, Inc.
(ColorMate PS Model 40)
1414 Massachusetts Ave.
Boxborough, MA 01719
(508) 264-8759
fax: (508) 264-8000
Circle 1134 on Inquiry Card.

Océ Graphics USA, Inc.
(G5241-PS/4)
385 Ravendale Dr.
Mountain View, CA 94039
(415) 964-7900
fax: (415) 961-6152
Circle 1135 on Inquiry Card.

Seiko Instruments U.S.A., Inc.
(ColorPoint PS)
1144 Ringwood Court
San Jose, CA 95131
(408) 922-5800
fax: (408) 922-5840
Circle 1136 on Inquiry Card.

Tektronix, Inc.
(Phaser II PXi)
26600 Southwest Pkwy.
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"...fast, easy to set up and use, and very powerful" PCM Magazine 12/91

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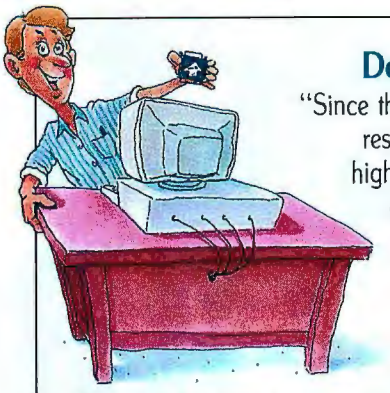


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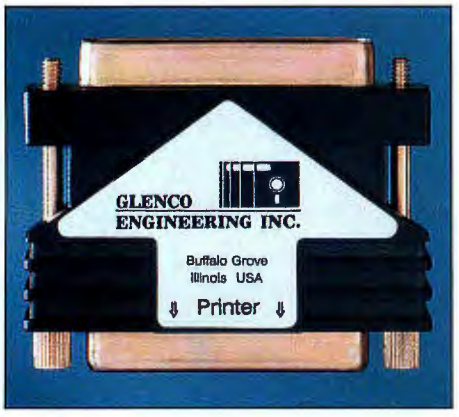
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"Since the Hardlock uses an algorithmic response chip, I am assured of the highest level of protection. Also, the optional programmable memory means I can keep custom configurations in Hardlock rather than in a file. I can protect my .EXE or .COM files directly and/or incorporate Glenco's high level language interface routines into my software. And, I feel confident I'll have Glenco's support if I use other programming languages."

Accountants Say. . .



"Hardlock provides our company with a healthier bottom line. Since our software can't be copied, our revenue has steadily increased. The unique programming board allows us to program the Hardlock in seconds. This ensures optimum delivery schedules from Glenco and a lower inventory cost for us. Hardlock's field programmable feature means a single Hardlock can protect more than one product."



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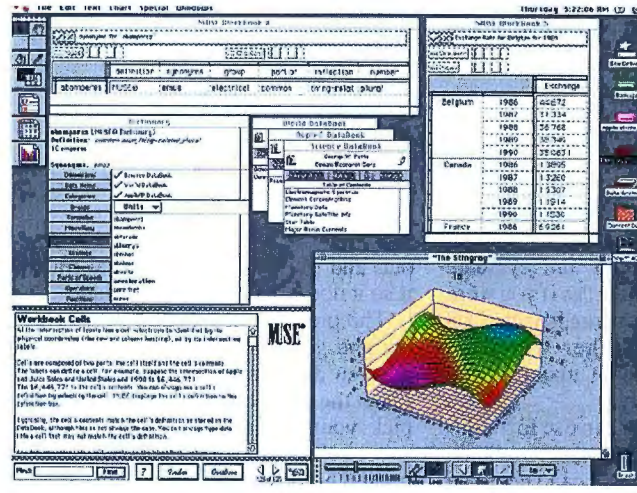
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APPLICATION

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Muse's graphics tools can chart the data you explore in WorkBooks.

Occam Research's Muse is an innovative Macintosh program that combines database and spreadsheet functions with a natural-language query tool. Because it facilitates analysis by making it easier to get through tons of information and find what you're looking for, Muse could help many managers and executives do their jobs faster, cheaper, and better.

Muse is one of the most impressive ad hoc data-analysis tools available today. It combines an internal database engine, data dictionaries, an English-like query system, what-if capabilities, and charting tools. This is an enterprise-wide program that you can use to view and analyze data from different locations. For example, you can tap into a database on a mainframe or an office file server and pull the information into your Mac.

Since Muse is an ad hoc data-analysis tool, you make it do your bidding by asking it questions. In the Script window, which looks something like a sheet of ruled notebook paper, you can type the query "How many copies of Product X did we sell in Europe last year?" On the next line, you get Muse's reply, which is based on information the program extracts from a database. You also use the Script window to define relationships in your data. The Script interface takes about 2 seconds to figure out.

The program's large built-in lexicon helps prevent it from falling into the trap of other natural-language parsing products: not understanding enough English words. Muse can evaluate the declarations or the questions you pose in the Script window by using its lexicon, by searching custom lexicons, by working with its built-in arithmetic functions, or by accessing data in its relational database. I found that it makes few mistakes.

Changing the program's knowledge base is relatively easy. You can add mathematical formulas, Boolean operators, constants, relational operators, and other functions to Muse's lexicon of more than 1000 definitions.

Because it is equipped with its own reference library, Muse can easily handle things such as unit conversions. You could, for example, ask it, "How many kilometers in 500 miles?" Muse already understands things like chemical formulas, the periodic table of elements, physical measurement systems, and other useful data (rather like the big tables you find in an almanac).

Pour Data into DataBooks

Muse stores the data you want to analyze in DataBooks, which are relational databases. These collections of information can sit on a file server, accessible to everyone on the LAN (they can be password-protected). Each one can contain data created within Muse or data from any number of other sources. You can import data from most popular databases and spreadsheets. The program supports common formats, such as DBF, WKS and WK1, SYLK, DIF, ASCII, delimited text, and fixed-field-length text. Each DataBook can hold up to eight dimensions. Muse lets you organize DataBooks of up to 64,000 homogeneous or heterogeneous data structures each.

Muse works with Apple's Data Access Language and with Fairfield Software's Clear Access program, both of which import data from SQL (Structured Query Language) databases into Muse DataBooks. I tested the Clear Access connection using a Sybase database running on a Next server. I was able to import data from the Sybase tables and use it to create DataBooks and WorkBooks. During testing, I also imported DIF, SYLK, and WKS files from other networked Macs and from the Next machine.

Setting up DataBooks will likely be considered a black art by many Musers. I

BYTE ACTION SUMMARY

- **WHAT MUSE IS**
  It's a data-analysis package for the Mac that combines some database, spreadsheet, and charting functions with English-language query tools.
- **LIKES**
  Query system, what-if capabilities, relational database engine, hooks to mainframe databases, and customization capabilities.
- **DISLIKES**
  Limited display of dimensions; difficulty of setting up DataBooks.
- **RECOMMENDATION**
  If you have Macs and need to access, query, and analyze data from different sources, buy Muse.
- **PRICE**
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- **FOR MORE INFORMATION**
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  42 Pleasant St.
  Watertown, MA 02172
  (617) 923-3545
  fax: (617) 926-3262
  AppleLink: OCCAM.HELP

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recommend that the chore be left to those in an organization who already understand how relational databases are designed. Even though the Muse reference manual makes a valiant effort to demystify the whole thing, Muse DataBooks are as serious as a heart attack and a pain to create.

The Spreadsheet Interface

Muse displays data in a spreadsheet format called a WorkBook. Although WorkBooks serve as data depositories, their primary function centers around analysis. Within a given WorkBook, you can pretty much flop around and evaluate your data any way you like, as if you were in a natural-language spreadsheet. You can fill WorkBooks either with data from a DataBook or with material that you've keyed in directly.

To work on data, you can use formulas or built-in arithmetic transformations. With the what-if tools, you can speculate on the effects of changes. (If, for example, you lower the CEO's compensation rate, what does that do to the bottom line?) You can create whole sections of speculative data, just to see how it plays out, and Muse will keep special track of it so it doesn't alter your real data.

Anyone who needs to sift through lots of data will find Muse helpful.

The program has a good set of charting and graphing tools (see the screen). As you'd do with a spreadsheet, you select the data you want to graph and then pick your chart type. Muse can draw two- or three-dimensional charts and animated graphs (time-series data can really benefit from that).

Needed: FPU, a Serious Mac

Muse needs an FPU. The program comes in FPU and non-FPU flavors, but I would not recommend running it without a coprocessor. If you expect to do complex graphing, you will fall asleep waiting for the machine to finish the floating-point machinations it must go through using Apple's SANE (Standard Apple Numeric Environment) routines without assistance from an FPU. The difference in my tests on a Mac IIsi (with the Apple NuBus/68882 FPU card alternately installed and removed) showed the considerable improvement the FPU made to complex graphing performance. Graphing was faster by as much as 50 percent with the FPU.

You'll need a serious Mac. While Occam recommends a 68030- or 68040-based Mac with a 40-MB hard drive and 5 MB of RAM, I'd say the minimal configuration to keep you sane would be a Mac IIci with 16 MB of RAM, a 160-MB hard drive, and an accelerated 24-bit monitor to display those snazzy animated graphs. You can run Muse with System 6.0.5 or higher, but Occam recommends System 7.0. You will also need a network connection so that you can import data from your databases sitting elsewhere or import simpler data (like Lotus 1-2-3



Rub lamp and say:
"I want vivid color from an affordable printer."
"I want vivid color from an affordable printer."
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Tektronix

Circle 163 on Inquiry Card.

WKS files) that's sitting on the office file server.

Quirks

Although others have reported some error-handling flubs with Muse 1.0, I could not duplicate these miscues. Indeed, Muse was a heck of a lot more stable than some of the tried-and-true data-analysis and reporting software I use regularly. Muse does have a couple of internal problems that should be fixed: Leading zeros are not permitted in lexicons, and Muse doesn't store dates as real numbers (so you cannot chart them).

One interface quirk that bothers me is the limit on the WorkBook dimensions that you can display concurrently. Although Muse can show as many as eight dimensions of data, it will show only four at the same time in one WorkBook. Because of this limit, you can't display a WorkBook in which all eight dimensions contain real data vectors on the screen simultaneously. That makes anything more than two-way comparisons tough, since you are navigating through the additional dimensions as if they were pages or chapters of a book. Occam needs to improve on this display metaphor to make it easier to visualize multidimensional data.

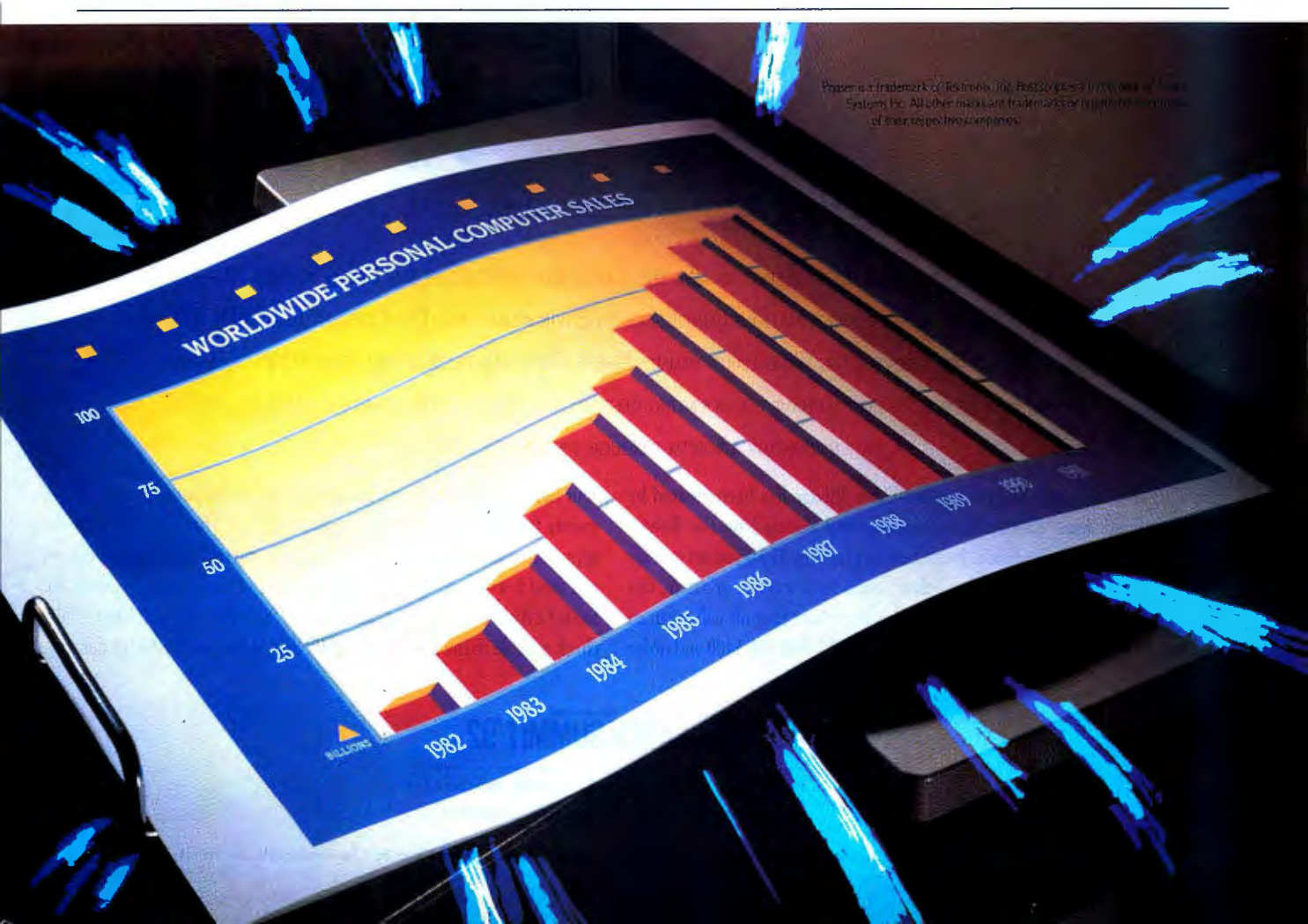
Who Needs Muse?

The most critical issue with Muse is not its prowess but its applicability. Anyone who needs to sift through lots of data—from financials to survey results to baseball statistics—will find Muse helpful. It can be particularly good at examining scientific data (with its graphical orientation and scientific lexicon) and at business forecasting (where the query language will allow exploration of some pretty amazing what-ifs).

The critical implementation issue with Muse is the DataBooks. Corporations will want to build many DataBooks from their SQL tables and other big-iron data and stick these DataBooks down on departmental servers, where Muse users can access them. Frankly, even with decent connectivity tools like Clear Access, if you have to build the DataBooks yourself by importing data from a SQL table or even from more prosaic sources like a dBase DBF file or Lotus WKS file, you'll be much less likely to use Muse as it's intended. The data-import function, like that in most data-analysis products, will numb you into submission if you aren't careful. Importing can be tedious with Muse because you have to spend a lot of time setting up the import filters. Better let your IS jocks put together some institutionally important set of DataBooks that you can start with.

Muse is not magic. But it does give IS managers some good tools for getting the data from the mainframe to the local Mac server, including its own flat-file data loader as well as SQL hooks, courtesy of Fairfield Software's Clear Access SQL system and Clear Links code. This is a new kind of tool that executives and managers need to explore. If you're using Macs and need to do ad hoc analysis of data from different sources, you should buy Muse. ■

Don Crabb is the director of laboratories and a senior lecturer for the computer science department at the University of Chicago. He is also a BYTE consulting editor and the author of MacWeek Guide to System 7. *He can be reached on BIX as "decrabb."*



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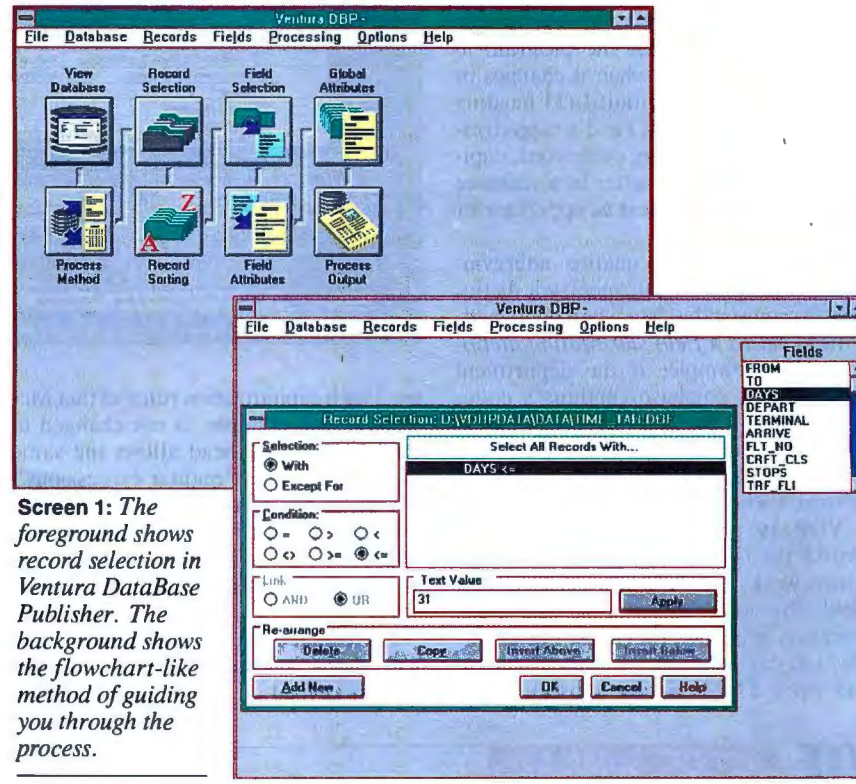
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APPLICATION

Database Publishing with Style

JAMES E. POWELL



Screen 1: *The foreground shows record selection in Ventura DataBase Publisher. The background shows the flowchart-like method of guiding you through the process.*

Turning database information into a good-looking document can be a tedious, time-consuming task, even with a good report writer. Enter two database publishing programs: Ventura DataBase Publisher (VDP) and PageAhead. Both are Windows programs that let you take gallons of data, funnel it through a desktop publishing package, and generate an attractive report. Both offer features that make converting data into a polished catalog, directory, or price list an easy operation, even for people without programming skills or extensive database experience.

The trouble with standard database report writers, even add-ons such as R&R Relational Report Writer, is that they don't offer the sophisticated formatting and layout tools found in desktop publishers. The trouble with desktop publishers is they don't let you tag specific text—a last name or a title, for example—across a whole document all at once; you have to format or stylize each text string individually. This can be a Herculean task when working with a large database.

Database publishing combines the retrieval features of a database with the typographical power of a desktop publishing package. VDP and PageAhead let you specify which records you want and how they should be sorted. You can set fonts and formatting features and then export the results to a desktop publisher to perform the actual printing.

For example, VDP can publish data stored in DBF (dBase) files or convert data from a flat ASCII, SDF, or CDF file. The program can pour data into Ventura Publisher 2.0 and higher, PageMaker 3.1 and higher, and any version of Interleaf. (A GEM version is also available.) PageAhead 1.1 supports DBF and Oracle files. It prepares data for use with PageMaker 3.x and 4.x; with the latest version, 1.1, it now works with a variety of word processors.

These two programs will save you considerable time and energy when you have updated your database and are ready to generate a new version of the output. They let you reuse layouts and text styles. To create an updated publication, you simply import the updated database into your database publishing package; a new edition is ready for printing. If you need different versions of the same document (e.g., a regional directory and a companywide version), you just change the selection criteria from within the database publishing package.

Ventura DataBase Publisher 3.1

Either with a pull-down menu or with icons in a flowchart format (see screen 1), VDP leads you through all the necessary steps of producing a report: selecting and viewing the database, choosing a process method (the publishing software), selecting records, sorting data, selecting fields, assigning field attributes, setting global attributes, and producing the output.

When you select a database, VDP displays a window showing the field names on the left and the values for the first record on the right. You press buttons to move to the first, last, next, and previous records, or you can jump to a specific record using a search value. VDP and PageAhead don't let you change values in the database—you can only view them.

The next step in VDP is to select the process method. Besides choosing which desktop publisher to use, you can give VDP specific formatting commands: Add tabs after each field to create a quick columnar report or add an em space before each field and a carriage return at the end of each record so text will wrap from line to line, depending on how you set up the desktop publishing program.

Using on-screen push buttons, you then select which records are to be included. You can select records that match or fail to match one or more conditions. You pick the field name from a list box, specify matching conditions in another box, and push radio buttons to select the condition (equal to, less than, and so on).

Sorting records is not complicated: From a list box, you select the field and specify ascending or descending order. You can specify the type of sort, such as ASCII, or use a custom sort table. The custom option lets you specify letters with the same weight; you can use this to let *E*, *e*, and *ê* sort together. You can also specify how to sort numbers: as numerals or as characters. And you can capture a first-letter change, which is useful for personnel or phone directories.

continued

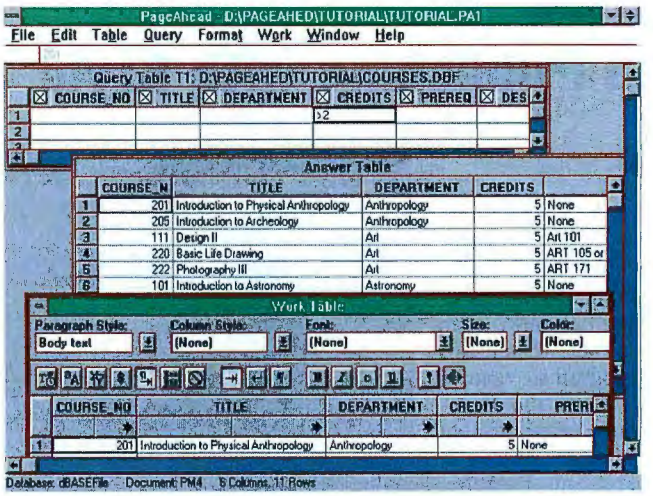
In the next step, you set field attributes. This is where VDP really shines. Here you assign database publishing tags to a field, text to print before or after the field, formatting commands, and whether a field should be used for a heading. You can set single or multiple fields as headings. You can tell the program to print a heading only when it changes or if any field within a multifield heading changes. You can set a field's capitalization rules—capitalizing each word, capitalizing just the first letter in a sentence or phrase, or setting text as uppercase or lowercase.

If your database contains abbreviations or codes, you can specify a dictionary to convert the data when published. This is called a *field substitution dictionary*. For example, if the department field in your database contains a code, such as "45," you can tell VDP to print "Systems Development" instead. You don't touch the original data; you merely convert it when it is published.

VDP also provides word substitutions. Unlike the field substitution dictionary, which works on the entire contents of a field, the word substitution dictionary works on words within fields. For example, you can enter #1.23 in the database and print £1.23. String substitution is used with capitalization rules so that McDonald, for example, is not changed to Mcdonald. PageAhead allows the same option, as well as "regular expressions" for more powerful replacement rules. But VDP makes it easier to implement substitutions; it offers you fewer options and has a less confusing interface for this procedure.

Individual field formatting (i.e., type style, fonts, and so on) is tricky. Using a custom keypad on the screen, you click on the features you want to set. You can control the formatting characteristics each button represents. Unfortunately, with only three characters to work with on each key, the buttons' use may become obtuse: While Bld means bold, Hlb is less obvious (it means hard line break).

When you have finished formatting, you're ready to create the actual output file. VDP creates a text file and a "chapter" file. The .TXT file is displayed in a scrollable window, but it doesn't appear formatted. Rather, you see Ventura Publisher's formatting characters, such as <9> for a tab. PageMaker users will create two files: a .DBP and a .PM4 or .PM3 file (depending on which version of PageMaker you're using). Interleaf users get two .DOC files. Neither VDP nor PageAhead gives you a WYSIWYG preview before pouring the data into the desktop publisher.



Screen 2: *PageAhead uses a spreadsheet-like interface. In the Query Table (top), you select records; the Answer Table (middle) shows you the results; and the Work Table is where you specify text formats and styles.*

PageAhead 1.1

PageAhead offers many of VDP's features but has a unique interface that offers greater visual feedback about the final output. It uses three spreadsheet-like displays: one to show the field names and enter conditions, another to show the result of these conditions, and the last to control the actual display of data (see screen 2).

The first step in the process is to select a database. A Table Information window shows each column (field) name, its type (decimal, character, or date), and data length. Here you use PageAhead's first spreadsheet, called the Query Table. The field names are displayed in the column heading, along with a check box.

Here's an example of how this part of the program works. To select departments less than 100, enter <100 in the first row. You can enter AND conditions

BYTE ACTION SUMMARY

■ **WHAT DATABASE PUBLISHERS DO**
They take raw information from a database, funnel it into a desktop publishing program, and help you turn it into a good-looking report.

■ **LIKES**
Ease of use, ability to stylize text strings across an entire document, and sorting capabilities.

■ **DISLIKES**
Ventura's lack of support for word processors; PageAhead's high learning curve.

■ **RECOMMENDATION**
Although both packages can be recommended, PageAhead excels for its greater publishing capabilities and better use of the Windows environment. Ventura DataBase Publisher well serves Ventura or Interleaf users.

■ **PRICE**
Ventura DataBase Publisher 3.1, $295
PageAhead 1.1, $295

■ **FOR MORE INFORMATION**
Ventura Software, Inc.
15175 Innovation Dr.
San Diego, CA 92128
(800) 822-8221
(619) 673-0172
Circle 1229 on Inquiry Card.

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by placing two conditions in the same row, such as >100, <500. More than one condition can be entered in the same row (Sales < 1000, Department > 100) to include records that meet both conditions. If a record meets a condition on either of different rows, it is included. In addition, PageAhead supports the relational operators IS NULL, IS NOT NULL, LIKE, and NOT LIKE (the last two are for pattern matching).

This query-by-example mode is the default. PageAhead offers a mode for entering SQL (Structured Query Language) commands. You may want SQL mode if you are entering SQL extensions specific to a particular DBMS or entering complex entries (e.g., correlated subqueries). You can also view your query-by-example request in SQL mode to see how the translation is handled.

PageAhead allows you to combine information from two or more tables by joining the databases on common columns. Whereas VDP handles a single DBF file, PageAhead allows for relational processing.

When all conditions and check boxes are complete, you ask PageAhead to "query now" and it will give you an Answer Table. This shows the data retrieved by the query. It is for reference only; you can modify the table display but not the data itself. A form view lets you view any row of data in a data-entry form (one field and its value per line).

If the Answer Table shows you the data that you expect, the next step is to add the formatting commands. You do this by opening up the last of the three spreadsheet views, the Work Table.

The Work Table contains the same data in the same initial order as the Answer Table but provides several button bars. Clicking on the style bar gives you a menu of formatting tags, such as paragraph style, column style, font, font size, and color. The button bar contains three groups of buttons that provide shortcuts for layouts and replacements (e.g., capitalization and text substitutions). A set of layout-related buttons displays symbols to determine how data is separated (e.g., tab or new line).

PageAhead makes good use of the Windows environment. It's more graphical than VDP. Within the Work Table you can click and drag columns to rearrange them. You can change column widths by pointing to a boundary line between columns and dragging it until it's the width you want (or you can select a numeric value from a pull-down menu).

To sort data, you select the Sort menu option. A list of available columns is displayed. Click on the fields you want to sort on (up to 10), and they fill the "Sorting columns" list box. Pressing the Up or Down buttons allows you to rearrange the order of the sort fields selected.

Besides letting you choose ascending or descending order, PageAhead offers several unique sort options. You can sort a report on a field in the Answer Table or in the Work Table—including fields that do not appear in the report itself. You can also sort on what PageAhead calls "underlying data." For instance, PageAhead displays data as text, even for dates, but it will sort a field based on its actual type. Therefore, a text sort would display April 1 before March 1; when sorting by underlying data, PageAhead sorts the column according to the value in the field, so March 1 appears before April 1.

PageAhead also lets you create a summary, using operators such as MIN, MAX, SUM, COUNT, and AVG. This allows you to select two fields, such as department and annual sales, and generate an Answer Table summarizing sales by department.

When it comes to formatting, PageAhead lets you separate fields by tabs (the traditional approach) or group fields into a paragraph. At the end of each paragraph, PageAhead inserts a hard return. A pop-up window lets you specify text before and after each field, including spacing. If data is not present in the field, the text can be suppressed.

Formatting overrides can change paragraph or column styles when the value is found in a table. When a TERMS field contains "LIMITED OFFER," for example, you can print the text in bold. PageAhead can incorporate graphics in the final output, so a database field containing the filename of the graphical image can be interpreted to display the actual image in the final output.

Like VDP, PageAhead lets you replace data (e.g., "Southern Region" instead of "region 4") for entire fields or for just portions of text. You can delete data, too, so you can keep only an employee's last name in a full-name field. Another replacement option allows you to rearrange data, so that *A Tale of Two Cities* sorts as *Tale of Two Cities, A*.

Like VDP, PageAhead lets you specify capitalization rules and exception tables. A Separator Table stores the characters used to delimit words, and by default it includes characters such as (, [, /, ;, and +.

When you are ready to go to PageMaker, you save the PageAhead file, open PageMaker, and bring in ("place," in PageMaker parlance) the tagged database file.

PageAhead 1.1 can prepare files for Windows word processors, too. Specific directions are provided for Microsoft Word for Windows 1.1 and 2.0, WordPerfect 5.1, Ami Pro 2.0, and other word processors supporting RTF (Rich Text Format). It will also work with files for DOS word processors, including Word 5.0 and 5.5, WordPerfect 5.0 and 5.1, and others supporting RTF.

Which One?

VDP and PageAhead let database novices easily specify which records they want to include in a document. Both products are also good for anyone who does not have update access to a database but needs to change the way information is presented in print. You can change the look of the published data without modifying the original data itself.

VDP is easier to use than PageAhead, and its flowchart approach makes it easier for novices to get up and running quickly. VDP's variety of dictionaries and exception tables should be sufficient to modify the output of all but the most demanding reports.

Both programs support PageMaker. VDP also works with Ventura Publisher and Interleaf; PageAhead does not. But PageAhead does support several word processors; VDP does not.

PageAhead has several unique features, including the ability to work with relational databases, gathering data from more than one database. It also sports a stronger feature set—you have more options and control with PageAhead, but the trade-off is a higher learning curve.

If you routinely have to turn raw data into polished reports, you would do well to consider either of these programs. Of the two, I would pick PageAhead. It provides more publishing-type capabilities, makes more use of the Windows environment, and gives more visual feedback about how your document will look. VDP is more suitable for someone who is not a frequent user of desktop publishing or graphics programs and is mostly interested in cranking out a report quickly. Ultimately, your selection will have to depend on which database and desktop publishing packages you prefer. ■

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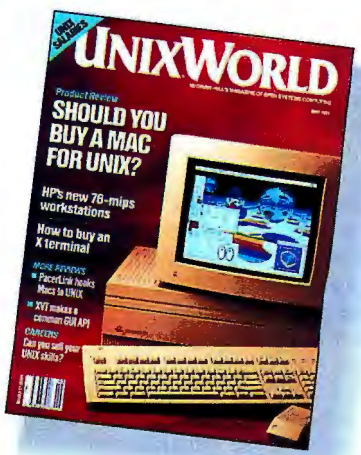
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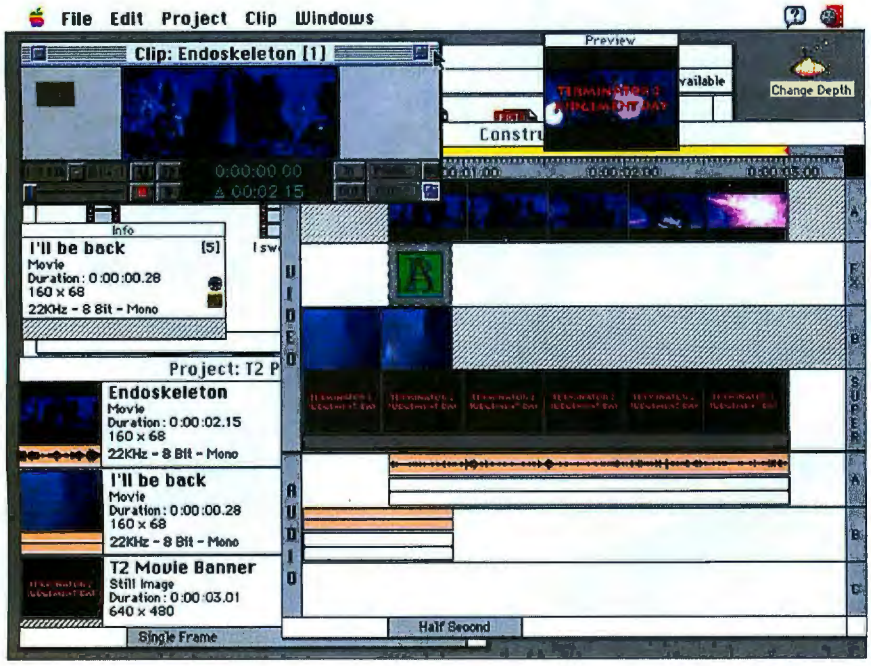
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HARDWARE / APPLICATION

Two Tools of the QuickTime Trade

TOM THOMPSON



Premiere has been used to consolidate two QuickTime video clips and apply special effects. Clips can be viewed in their own windows (as in the upper left part of the screen). The Project window (lower left) shows clips and information about them. The Construction window (most of the right side) shows a special effect (cross-dissolve) being applied to two video tracks, plus an overlay in the Super track. Sound tracks are at the bottom. The Preview window (upper right) shows the assembled result. (Terminator 2 *images courtesy of Carolco/Lightstorm.)*

One of the hottest tickets around features SuperMac Technology's VideoSpigot and Adobe Systems' Premiere, which debuted recently as two of the first tools for assembling QuickTime productions on the Macintosh. VideoSpigot is a real-time video digitizer on a NuBus board, and Premiere is movie-making and editing software that lets you combine audio and video.

If you'll recall, Apple's QuickTime gives the Mac OS a protocol for managing time-dependent elements, such as audio and video, and it represents a giant step forward in the integration of multimedia and personal computers. With QuickTime, Mac users can handle moving images combined with sound as they do other information on the Mac: by easily copying and pasting material from one area to another.

But before you can really take advantage of QuickTime, you need QuickTime data, or *movies*. VideoSpigot captures live video into a QuickTime movie format, and Premiere allows you to edit and merge these movies and audio data. These two products are sold separately. During my tests they performed nicely together and had me making QuickTime movies in a relatively short amount of time.

But my experience using both a Quadra and a Mac IIci also tells me there must be Quadras in QuickTime heaven: For performance's sake, you're better off doing QuickTime work with the most powerful Mac you can get.

At press time, other products, such as Diva's VideoShop software, were about to reach the market. Also, a handful of QuickTime applications were available (see the text box "Budget QuickTime Tools" on page 338).

Digital Video and Audio

The VideoSpigot board funnels in live video and audio signals, converts both to a digital format, and then saves this data to disk, all in real time. This is no mean feat considering that it captures and converts a screen of video (called a *frame*) to 24-bit digital data. Furthermore, VideoSpigot continuously processes 30 of these frames per second for NTSC video (or 25 frames per second for PAL, the European standard).

VideoSpigot does this by operating completely in YUV color space. YUV is a standard digital video format in which the frame information is encoded as a composite signal of chrominance and luminance data. This arrangement incurs no overhead or performance penalty because there's no video conversion between the Mac's native RGB space and the YUV format. For live NTSC video, VideoSpigot displays and records frames at fixed sizes from 160 by 120 pixels to 320 by 240 pixels. For PAL, the frame sizes range from 192 by 144 pixels to 388 by 288 pixels. You can record large images at 640 by 480 pixels (NTSC) or 768 by 576 pixels (PAL) from still video.

VideoSpigot's actual capture rate is determined by the frame size, whether audio is being recorded, the host Mac's processing power, and the hard drive's speed. Slower Macs will record video signals at lower frame rates. For example, a Mac IIci will handle about 15 frames per second.

VideoSpigot follows the Mac tradition of easy installation: You pop the hood on the Mac, plug in the board, load the software, and go. The board has an RCA jack for video input; there's no S-video connector. I tried VideoSpigot with two Macs in BYTE's Multimedia Lab. The first was a Quadra 900 with 8 MB of RAM and a 160-MB hard drive. I used the Quadra's built-in video. The second was a Mac IIci with 8 MB of RAM, an 80-MB hard drive, and an Apple 8•24 GC display board. NTSC video came from a Panasonic AG-7750 Super-VHS VCR, a Pioneer videodisc player, or a Canon A-1 digital video camera.

Dealing with audio input on the Quadra was just a matter of plugging a cable into the RCA sound jack on the computer's back and selecting it in the Sound Control Panel. Getting sound into the IIci was a tad more complicated: I had to

route the audio into an old Farallon MacRecorder and copy the MacRecorder Driver 1.0 to the Extensions folder.

VideoSpigot comes with a recording and viewing application called ScreenPlay. Using ScreenPlay to play the video on the Quadra, I got a 160- by 120-pixel window displaying the incoming color video in real time, with the audio blasting from the computer's hefty speaker. On the other hand, the Mac IIci was mute during recording, and the video display dropped frames as the computer struggled to keep up with the incoming data. This is because the ScreenPlay application disables the audio monitor on older Macs to prevent the computer from bogging down. Playing back a captured movie revealed that the audio was recorded in the file. You'll need an external speaker or TV to monitor the audio signal with this setup. The Quadra's own monitor and audio are more than adequate.

The frame-capture rate varies according to the Mac you're using and what you're recording. If you hold down the Option key when you start recording, ScreenPlay stores the frames into memory rather than to disk. This improves the frame-capture rate but limits the recording time to the amount of RAM you have. On the IIci, the frame rate varied from 10 to 15 frames per second, depending on the storage destination (disk or memory) and whether audio was being recorded. On the Quadra, values ranged from about 22 to 30 frames per second.

ScreenPlay provides basic editing tools. You can crop undesired sections out of the frame during the recording process. For example, while recording a letterboxed version of *Terminator 2*, I cropped out the black horizontal strips at the top and bottom of the picture to reduce the file size. Other controls let you adjust hue and saturation of the video. But ScreenPlay provides no way to adjust the brightness or contrast.

After you have recorded a video sequence, a slider bar lets you use the mouse to move about the clip to a general area of interest; two buttons let you step forward or backward a frame at a time to zero in on an exact frame. A pair of In and Out bars lets you trim frames from the beginning or end of a clip. VCR-style buttons let you start and stop recording video data easily. Oddly, ScreenPlay doesn't let you cut or paste clips.

Once you've captured and trimmed a movie clip to your liking, you save the raw data in a VideoSpigot file, or you can compress it, reducing the file size as it's saved in the QuickTime format. The VideoSpigot Extension supplies several compressor/decompressors for this purpose. You select a different bit depth (from black and white to millions of colors), the image quality, and the compression method from a dialog box. You can preview the effects these choices have on the clip before saving it. Currently, VideoSpigot uses Apple compressors, which compress at a ratio of 6 to 1.

By the time you read this, SuperMac expects to be shipping a software upgrade that will yield compression ratios of 20 to 1. Still, the high-quality versions of QuickTime movie files tend to be huge: Several seconds' worth can easily occupy 2 to 5 MB. If you plan to store more than a few short clips, you'll want a hard drive that's both fast (to help with the frame-capture rate) and large.

Adobe's Premier Editing Studio

Once you've captured video clips using VideoSpigot, what do you do with them? This is where Adobe's Premiere application steps in. The program, originally developed by SuperMac, is analogous to an editing studio, where you combine sound and video, along with special effects, to make a complete movie. I was able to combine a variety of sounds, clips, and effects to make movies (see the screen).

You start by importing the various components that you'll need. These can be VideoSpigot clips, other digitizer boards' QuickTime movies, sound files, and PICT images that act as mattes or overlays. The windows containing the clips have sliders and controls so that you can preview them and set In (starting) and Out (ending) points. Premiere uses 32-Bit QuickDraw's `GWorld()` traps, which provide two major benefits. First, they give you precise color control, especially for dithering a 24- or 16-bit clip down into an 8-bit-deep graphics environment. Second, on those graphics accelerator boards that are equipped with `GWorld()` RAM, the movie data gets cached on the display board, resulting in faster screen updates and playback.

Next, you load your choices into the Project window, which serves as a data

BYTE ACTION SUMMARY

- **WHAT VIDEOSPIGOT AND PREMIERE ARE**
  SuperMac's VideoSpigot is a real-time video digitizer board that creates QuickTime movies. Adobe's Premiere is a program for assembling and editing QuickTime movies.
- **LIKES**
  VideoSpigot and Premiere complement each other as hardware and software components. Both are reasonably priced and easy to use.
- **DISLIKES**
  VideoSpigot needs brightness and contrast controls, and it doesn't let you cut and paste. Premiere needs Balloon Help to guide the novice; 8-bit audio output could be a limitation for some users.
- **RECOMMENDATIONS**
  Anyone who wants to use QuickTime for media integration on the Mac, and wants to do it now, should consider this winning combination.
- **PRICE**
  VideoSpigot: NuBus version, $599; Mac IIsi and LC version, $499; Premiere, $495
- **FOR MORE INFORMATION**
  SuperMac Technology
  485 Potrero Ave.
  Sunnyvale, CA 94086
  (408) 245-2202
  fax: (408) 735-7250
  Circle 1221 Inquiry Card.

  Adobe Systems
  1585 Charleston Rd.
  P.O. Box 7900
  Mountain View, CA 94039
  (415) 961-4400
  fax: (415) 961-3769
  Circle 1222 on Inquiry Card.

Budget QuickTime Tools

You don't have to be George Lucas or Steven Spielberg to produce QuickTime movies. Several low-cost editors and players are available, and more are on the way.

Popcorn, a freeware application from Aladdin Systems, lets you play QuickTime movies and provides rudimentary editing operations, such as trimming sections out of QuickTime movies. Contact Aladdin Systems, Deer Park Center, Suite 23A-171, Aptos, CA 95003, (408) 685-9175.

For those who need to make Mac software product demos or training tapes, there's Spectator. It records Mac screen activity and stores it as a QuickTime movie. You can save these movies as stand-alone applications that play themselves, much like self-extracting archives do. Spectator costs $200 and is available from Rock Ridge Enterprises, 620 Hidden Valley Dr., Suite 102, Ann Arbor, MI 48104, (313) 663-0706.

Also from Rock Ridge Enterprises is VideoBeep, a $40 product that patches the system beep so, instead of the Mac just beeping, it plays a QuickTime movie. It's a neat hack that undoubtedly consumes lots of CPU clock cycles just to present something on the screen when an alert appears. But it turns your machine into something more entertaining than just a 9-to-5 data bucket.

container for PICT images, movies, and sound clips. Then you drag the desired clips into the Construction window. This window acts as an electronic storyboard where you assemble the final movie. Here you set the time interval when certain clips of video or animation appear, apply special effects, and add or mix sounds. You have two video channels (A and B) to switch between: a track that lets you superimpose an image over the video (Super), and a special-effects channel (FX) that lets you specify what effect to apply to the A and B channels and when. You can lay three sound tracks onto a movie simultaneously, and you have separate controls for each track's volume.

You have to crack the manual to figure out this entire process, but once you understand this sequence of importing, collecting, and assembling various clips into a final movie, you'll be able to produce slick QuickTime movies rapidly.

Premiere does not store clip information in its project files; instead, the project files store pointers to the various clip files on your hard disk. If you delete the clip files from your computer, you lose them in Premiere as well.

While Premiere can import 22-kHz stereo sound files, the current version is capable of outputting only 8-bit 22-kHz monophonic sound. This will be a drawback for people who work on certain types of presentations; digital artists generally agree that 16-bit sound is the minimum for professional-quality audio.

Premiere supplies a bevy of special-effects plug-in modules. You just click on the effects you want and drag them into the Construction window. You can determine when and how long an effect lasts by stretching the icon in the FX track. By double-clicking on the special-effects icon itself, you can modify its attributes. For example, a page-turn effect that simulates turning a page in a book has controls so that you can choose which video track is flipped away to another track, the flip sequence (forward to reveal the scene or backward to hide it), and in which direction (from any of the four corners) the turn begins. Filters let you adjust the brightness and contrast of a clip, invert the image, apply gamma corrections, and more. Premiere accepts and uses plug-ins from Adobe's Photoshop program, and Adobe plans to release information on the special-effects architecture so that third-party vendors can write additional modules.

If you want to preview a movie, you can press the Enter key at any time and then wait a few seconds while the program assembles the elements. When the preview sequence looks good, you then "compile" the Construction window's information into a QuickTime movie. As with ScreenPlay, you can adjust the bit depth of the result, the type of compression to use when saving the movie, and its image quality. You can compile just a section of the movie or the entire contents of the Construction window.

Premiere does its job handily as a QuickTime movie editor. It enhances the value of VideoSpigot by allowing you to correct the brightness and contrast of your clips and assemble the raw material into a finished, polished product. The program does not provide for time codes, so you can't transport rough-cut QuickTime movies to a professional editing system for final polish.

Premiere's one major flaw is its maddening tendency to have essential menu items be dimmed until you click in just the right window or workspace. Implementing System 7.0's Balloon Help, in which the balloons would explain why an item is dimmed (e.g., "You need to pick an object in the Super track to use the Transparency Settings") would eliminate this frustration.

Judgment Day

Who needs these two QuickTime tools? Anyone who must capture data from different sources and edit it into a professional-quality presentation, such as a sales report with animated graphics or a training video. For example, a health-care company might create a document that uses video and audio to teach about electrocardiograms. The video material would show trainees what they might see on a scope in intensive care, while the sound would give them an idea of what they might hear using a stethoscope. The presentation's creator could use VideoSpigot to capture the screen traces and sound and could then turn to Premiere to edit the captured data before pasting it into the final document.

Keep in mind that QuickTime is at the edge of new technology, and that edge is somewhat rough. VideoSpigot and Premiere are very helpful tools, but they are limited by the constraints of QuickTime, particularly in the picture window's size. Don't expect the movies on your Mac screen to look like the movies coming out of your VCR. What's most important about these tools is what they portend.

VideoSpigot and Premiere complement each other perfectly: VideoSpigot hardware creates QuickTime videos that Premiere then lets you put together in useful ways. Both products are practically required for any serious QuickTime work. The possibilities are limited only by your imagination. ■

Tom Thompson is a BYTE senior technical editor at large. He has a B.S.E.E. from Memphis State University and is a certified Macintosh developer. You can reach him on BIX as "tom_thompson" and on AppleLink as "T. Thompson."

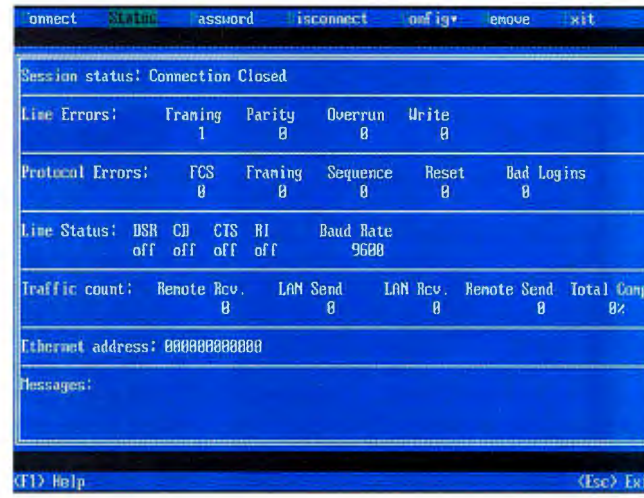
SOFTWARE

RLN Spells Long-Distance Ethernet

BARRY NANCE

When you're on the road or working at another site, information back on the office LAN doesn't grow less valuable; you still need access to central databases, mail, and other services. Unfortunately, you can't string a LAN cable between the home office and every remote location. You'll need to rely on telephone lines, and that means relatively slow modem connections.

You've got a few alternatives in connecting to a LAN through asynchronous lines. You can use remote-control software, such as Microcom's Carbon Copy, which shuffles key presses and screen images across the phone line. Or you can use a special LAN remote-control package, such as Novell's NAS (NetWare Access Server), which multitasks several remote sessions in a 386 or 486 PC but remains a remote-control program at its core. Or you can buy a LAN-aware modem, such as the Shiva NetModem-E. This eliminates the smoke and mirrors of remote control by extending local-node status out to the dial-in machine. But such modems support only a few network protocols.



RLN's exhaustive statistics make troubleshooting easy.

In the end, the solution that comes closest to running an Ethernet cable directly from site to site is RLN (Remote LAN Node), a MAC (media-access-control) bridge from ICC (Intercomputer Communications Corp.). Although its memory usage is high, RLN outperforms remote-control software in many applications without restricting you to a few protocols.

The software turns a dedicated network machine into an RLN server to create the MAC-level bridge between the local network and the dial-in machines (RLN clients). The RLN client runs all applications on its own processor, with the distant network appearing to be locally connected. File-service packets alone travel across the phone line.

The RLN server is a multiport LAN bridge. RLN can maintain up to 16 concurrent connections with an optional ICC multiport serial board, or two simultaneous connections without additional hardware.

Looking into RLN

The RLN server, a physical Ethernet node with a single Ethernet card, forwards file-request packets from your remote PC to the file server. It acts like a router on behalf of its asynchronous clients, each of which has a unique virtual Ethernet address. Network packets sent over the phone lines are presented on the local network with the (virtual) sender address of the remote client; packets on the network destined for any remote client are plucked off the network and distributed to the appropriate client by the RLN server. RLN does not support network bridging or X.25 links in this release.

Between the remote PC and the RLN server, ICC uses the Point-to-Point Protocol. PPP provides a method for transmitting datagrams over serial point-to-point links. It has three different components: a method for encapsulating datagrams over serial links, an extensible Link Control Protocol, and a family of Network Control Protocols for establishing and configuring different network-

BYTE ACTION SUMMARY

WHAT ICC REMOTE LAN NODE DOES
RLN establishes your remote workstation as a node on the network, turning the phone line into a LAN cable.

LIKES
RLN's clean approach to remote LAN access eliminates the performance bottlenecks of remote-control packages and the protocol dependence of LAN-aware modems.

DISLIKES
Memory usage is high, unless you can manage to shoehorn the protocol stack into upper memory on a 386 machine.

RECOMMENDATIONS
RLN is ideal for client/server LAN applications, but it's appropriate for any remote LAN connection with a reasonably powerful client.

PRICE
Two-user version, $430
16-user system, $6600

FOR MORE INFORMATION
Intercomputer Communications Corp. (ICC)
8230 Montgomery Rd.
Cincinnati, OH 45236
(800) 274-6633
(513) 745-0500
fax: (513) 745-0327

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layer protocols.

RLN supports a wide variety of network protocols and network operating systems, but only on Ethernet. You can use NDIS, PDS (Packet Driver Specification), or ODI (Open DataLink Interface) drivers that are supplied with RLN to connect to NetWare (IPX/SPX), Unix (TCP/IP), Banyan Vines (SPP/IPC), and either LAN Server or LAN Manager (NETBEUI). Because it is implemented in software, RLN can support additional network protocols with relatively simple software updates.

By default, RLN runs the PDS stack. PDS creates a multiplexed environment for the network adapter that lets multiple protocol stacks share the adapter. The PDS driver that ICC supplies allowed me to load a TCP/IP and a NetWare protocol stack on a remote client RLN computer. Through RLN, I could remotely access both a NetWare file server and a Unix file server at the same time. LAN-aware modems and NAS don't allow this kind of multiprotocol connectivity.

RLN doesn't support Token Ring or ARCnet, but you can, of course, bridge to other topologies on the host LAN. On my NetWare LAN, I put an Ethernet card in the file server alongside a Token Ring card and used NetWare's internal bridging capability to put the RLN server on the network. ICC says that RLN will directly support Token Ring in the future, but the company doesn't plan to support ARCnet.

In the Real World

I put RLN through its paces in two different situations. First, I connected through Intel 14.4EX modems to an RLN server on my combined NetWare 3.11 and LAN Manager 2.1 network (running on SMC Elite16 Ethernet cards). I also got permission from one of my software clients to try RLN at his company's office. The client is a regular user of NAS, and I wanted to see how RLN performed for the client in day-to-day remote dial-up sessions.

RLN's menu-driven installation and well-written documentation made installing RLN easy on my own LAN and at the client site. Configuration is a simple matter of specifying phone numbers, COM port usage, data transfer rate, and other communications parameters. Once RLN was up and running, it did its job transparently and unobtrusively.

The RLN client TSR program takes up 55,872 bytes of RAM—not exactly a trivial requirement—but I was able to load it into high memory with 386Max. This TSR takes you only as far as the MAC layer; you also need the usual protocol stack on top of RLN. If you're accustomed to using IPX/NETX, you'd use RLNIPX and NETX to access a NetWare file server. With ODI, you would use LSL (the link-support-layer driver), PDETHER (an Ethernet packet driver module), IPXODI, and NETX. You would load NETBIND and NET START for LAN Manager, BAN.EXE for Banyan Vines, or ETHDRV for FTP Software's PC/TCP. These modules use varying amounts of memory, but they are typical for network drivers. For example, the RLNIPX module uses 28 KB.

Although RLN is a new product, it shows considerable stability.

Performance depends on the speed of the modems you use with RLN. RLN works with Hayes-compatible modems at speeds of from 1200 bps to 38,400 bps. The data-compressing Intel modems I used ran with an effective throughput of about 32,000 bps. With these modems and with most frequently run executable files (LOGIN.EXE, MAP.EXE, and applications software) running on the client, I found that RLN delivered reasonable response times.

I found similar results on my client's network. For copying files and accessing application data files, RLN was about twice as fast as NAS. It's tricky to try to compare the two, though. An application that does plenty of screen updates will cause more NAS traffic. Conversely, an application that does lots of file I/O will cause more RLN traffic. The performance of NAS and RLN depends on the relative amounts of file I/O and screen activity.

MNP level 5 or V.42bis data-compressing modems help performance in any case. RLN also implements three types of packet-level compression on its own: Tinygram Compression (a part of PPP), which strips trailing zeroes from packets; Header Compression, which reduces encapsulating packet overhead; and an ICC proprietary compression algorithm.

Once you're logged into your LAN, your access to the file server and shared network printers becomes almost completely transparent. Since your RLN client workstation is just another node on the LAN, you can transfer files with just a DOS COPY command. To do the same thing with remote-control software, you would have to invoke a special file transfer utility.

RLN modifies SYSTEM.INI and WIN.INI files on RLN clients that run Windows. The modified configuration files load drivers that enhance communications performance under Windows. Windows executables, data files, and especially the Windows swap file should reside on your local hard disk. Loading these files across a communications link makes for very sluggish performance.

On my home LAN, I performed a stress test on RLN by disconnecting the telephone wire to simulate a dropped session; RLN promptly notified me that the communications session had abruptly ended. You must reload the protocol-stack TSRs to reconnect, as noted in the documentation. RLN performed reliably and accurately in other tests, as well. Although RLN is a new product, it shows considerable stability.

Statistics and Security

I was impressed by RLN's statistics. RLN displays data traffic totals as well as counts of communication line errors, protocol errors, and bad log-ins. Having statistics like these helps you to solve communications problems when they occur. You can monitor remote sessions at the RLN server computer.

RLN offers three levels of security on top of any security provided by your network operating system. First, an RLN server can check dial-ins against a database of valid user IDs. Second, RLN has dial-back capability. For very sensitive installations, you can use RLN's Remote Security Adapter, a dongle that must be attached to each remote site to allow access.

The bottom line is, RLN works well. For anything more than the most infrequent dial-up to a distant LAN, RLN is a good solution. It offers a clean, protocol-independent approach that paves the way for remote access to client-server applications. ■

Barry Nance, a programmer for the past 20 years and a contributing editor for BYTE, is the author of Using OS/2 2 *(Que, 1992),* Network Programming in C *(Que, 1990), and* Introduction to Networking *(Que, 1992). He is the editor for the IBM Exchange on BIX, where you can reach him as "barryn."*

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H-1

SPA Don't Copy That Floppy

REVIEWER'S NOTEBOOK

S3 Irons Out Incompatibilities

When we last looked at Windows accelerators based on S3's popular 86C911 chip (see "Tweaking Windows: New Adapters Boost Speed and Clarity," January BYTE), the chip's incompatibilities with the Video Electronics Standards Association's VBE (VESA BIOS Extension) had not been fully addressed by S3 or accelerator-board vendors.

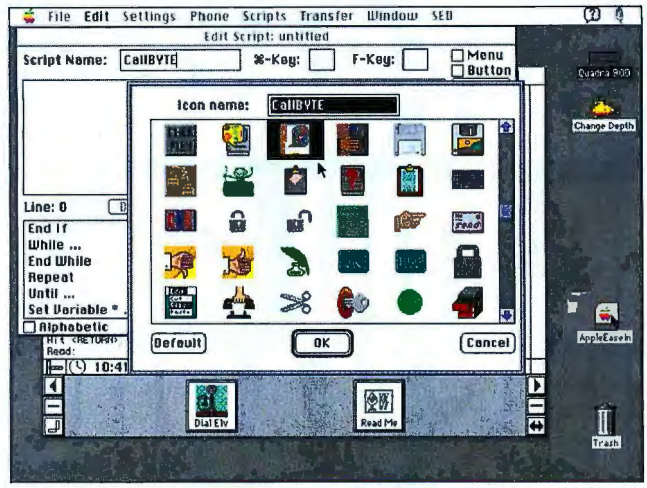
Since January, S3's chip has gained wide acceptance, and noncompliant 86C911 chips are now shipping with accelerators from dozens of vendors. By freeing the CPU from BitBlt, line drawing, font regeneration, and graphical fill functions, the 86C911 can speed some Windows applications from two to 25 times.

However, those of us who also work outside the Windows environment often require a VBE-compliant driver. VBE-dependent applications, such as Animator Pro, simply do not function using an S3-based accelerator in higher 8-bit Super VGA resolutions such as 1024 by 768 pixels. The bottom line: We must run DOS applications at lower 320- by 200-pixel by 8-bit VGA resolutions if we're using an S3-based adapter.

At press time, S3 said that a VBE-compliant version of the chip was in beta testing and would be shipping to OEMs by June. S3's new version is designed to accelerate Windows applications using direct S3 calls and provide full VBE compliancy for DOS applications that require higher Super VGA 8-bit resolutions.

How will end users obtain upgrades? Few adapter manufacturers have addressed the issue, in part because the 86C911 chip is hard-wired on most accelerators. However, at least two companies, Diamond and Orchid, now offer upgrades of their own VBE-compliant BIOSes at no charge to customers.

Other manufacturers we spoke with were unaware of the 86C911/VBE noncompliancy issue and said they would wait for S3's next chip release rather than supply user upgrades. Still others planned to offer a VBE-compliant S3-TSR DOS driver for their adapters.



When writing a MicroPhone script, you can associate a telecommunications procedure—dialing the company mainframe, for example—with a push-button icon. The program includes a collection of icons with the script editor.

S3 noted that the VBE standard, at present, makes no provisions for accessing the S3 enhanced graphics functions hard-coded on the 86C911 chip. According to Jake Richter, a VESA director and president of Panacea, the VBE/S3 compliancy issue will be examined in a future VESA meeting.

New MicroPhone Plugs into System 7.0

Red Ryder, the telecommunications program for the Macintosh, has been as trusty as an old Shetland pony. But when we were setting up a new Mac recently, it seemed like a good time to switch to a package that knows System 7.0. As luck would have it, the newest version of MicroPhone II showed up. Software Ventures has equipped version 4.0 with the hooks to take advantage of System 7.0's more sophisticated functions.

With Publish/Subscribe, MicroPhone will automatically send downloaded data to any other System 7.0–savvy application. You could have the communications package pour on-line information—stock quotes, for example—right into an Excel worksheet or graph. This isn't something that everyone needs, but if you want a link between an application and some on-line information, this will do it. MicroPhone can also now respond to Apple events, which is a System 7.0 means of passing messages (e.g., Open Application, Print Document, Do Script) between Mac applications.

Scripting is usually a cinch. You can either go into the script editor and pick the commands you need or just tell MicroPhone to "watch me." In this mode, the program records your keystrokes and then compiles them as a script.

For the most part, scripts are portable between Mac and Windows versions of MicroPhone II. We ran into a few snags trying to share scripts between platforms, and a couple of times the program wouldn't put an icon on the button bar (even though it was aware of the script). But other than that, this new version has worked perfectly, with solo and shared modems.

Easy to learn and easy to use, MicroPhone has always been one of the best programs for communicating outside the Mac. Now, with the System 7.0 capabilities, it's able to communicate within. If you're a MicroPhone user running System 7.0, upgrading to version 4.0 is a no-brainer. If you're running System 7.0 and looking for a new telecommunications package, this is the one. ■

—The BYTE Lab

Reviewer's Notebook provides new information—including version updates, new test data, long-term usage reports, and reader feedback—on products and product categories.

ITEMS DISCUSSED

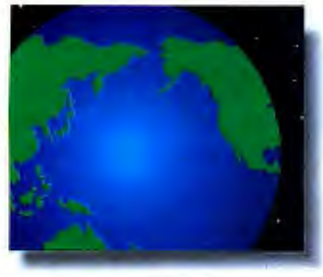
86C911 GUI accelerator
S3, Inc.
2933 Bunker Hill Lane
Santa Clara, CA 95054
(408) 986-8144
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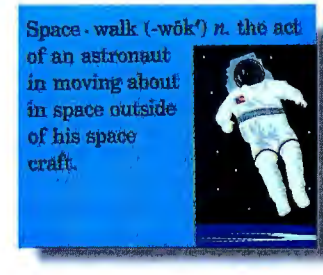
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BOOK
AND CD-ROM REVIEWS

HUGH KENNER



THE IMPORTANCE OF BEING SINGULAR

War in the Age of Intelligent Machines
Manuel De Landa
MIT Press, 1989, $16.95 ($32.95 hardcover), 271 pp.
ISBN 0-942299-75-2 (paper).

For at least a little past its first half, Manuel De Landa's *War in the Age of Intelligent Machines* is wholly absorbing once you've forced your eyes to cope with an infinitesimal typeface. He's picked up from chaos theory the notion of singularities—those points at which bland order suddenly changes to a more intricate order called turbulence, which in turn mutates, at the next singularity, back to docile order again. The "sound barrier" that infamously tore airplanes apart is a pre-chaos-theory instance; nowadays, F-15s and Concordes penetrate it routinely.

For De Landa, singularity is a term heaven-sent to ease the historian's job. History? A list of singularities encountered, followed by innovative ways to beat them.

Suppose, in the age of muzzle-loaders, you want an *accurate* handgun. Those available are essentially portable cannons, needing a hand free to light the fuse. So you support the gun with just the remaining hand. That means it has to be heavy, lest it recoil out of control. To lighten it, we'll need a mechanical igniter; in 1424, the matchlock makes its appearance. It's essentially a way to make trigger pressure shove a burning wick into the powder. Now we have a lighter gun we can guide with both hands, which is a beginning.

Next, ways to get rid of that matchlock altogether: wheel lock, flintlock, percussion cap. Each involves a tracking of singularities. The percussion cap depends on two: the detonation threshold of metallic fulminating salts, which an adequate blow will explode without a spark, and the pressure threshold of the black powder that, once ignited by the fulminate, will drive the bullet. Black powder needs confinement of gases to explode. That made muzzle-loading seem best; breech-loading can't guarantee that no gases will escape toward the rear. That in turn was solved by confining everything toward the rear in a pressure-tight cartridge: the bullet, the right amount of powder, the right fulminate, and the percussion cap.

And now that we're no longer inserting the bullet down the barrel, we can "rifle" the barrel with spiral grooves to exploit a singularity of the moving bullet: Once set spinning at a certain rate, it's stable in flight, especially if we make it cone-shaped. And aha! Now we can *really* take aim! By 1870 (the Franco-Prussian war), everyone on both sides is at last using breech-loaders.

Before the infantry could take reliable aim, their job was simply to make a constant wall of flying lead, groups firing as other groups reloaded. That lent itself to the *clockwork* model of command. Clockwork transmits power, initiates none; from a general sitting at the top, the orders run down clear to the lowliest private. It's like powering a complex of factories from one waterwheel. But power in modern factories is decentralized—an electric motor at every loom—and modern armies rely on subsystems of initiative, right down to Private Jones deciding whom to shoot at. By De Landa's account, the central command has never been altogether comfortable with that. Thus, in the 1950s, enter (under military auspices) the computer, that prime centralizer.

Writing, as he was, in the mid-1980s, De Landa was under the spell of buzzwords now obsolescing: "the Pentagon" and "the military-industrial complex." As early as page 6, he's hinting darkly that "the military," with the CIA and the National Security Agency, has "high stakes" in the game of "controlling the future of computers." By a wonderful irony, his book was closed off just too soon to allow for the newest singularity: the *de*centralized computing of PCs. That helped counter the Soviet Old Guard's insurrection late last year by getting out news that *Pravda* couldn't control. ■

Hugh Kenner is Franklin and Callaway Professor of English at the University of Georgia. He writes for publications ranging from the New York Times *to* Art & Antiques. *His recent books include* Mazes *and* Historical Fictions. *He can be contacted on BIX as "hkenner."*

FIXING DEAD MACS

The Dead Mac Scrolls, Larry Pina, Peachpit Press, 1992, $32, 484 pp., ISBN 0-940235-25-0.

There's nothing more exasperating than that chilly morning when your car—for no good reason—refuses to start. Running neck to neck with this calamity is the MacFolk's most primal fear: the Mac that won't start. Mug in hand, your morning cheer is rent asunder when you switch the Mac's power on, only to hear a quartet of plaintive notes and see a dark screen. This "death riff" indicates a hardware failure of some sort. Maybe this trouble crept up on you, or maybe you just put in that extra 4 MB of RAM yesterday. In either case, it's time to yank Larry Pina's *The Dead Mac Scrolls* off the shelf.

The title is accurate: The book deals with dead Macs and contains exhaustive information about all types of hardware failures. Pina breaks down the information by Mac product line and peripheral types, such as laser printers, floppy drives, external hard drives, and monitors. You crack the book to the appropriate section and leaf through it until you find a page that describes your computer's symptoms. Pina describes a possible cause for the failure and gives remedial actions. Some actions, such as checking the cabling and IDs on your SCSI peripherals, adding terminators, or adjusting SCSI cable lengths, you can handle yourself. Other suggestions point out a faulty component that you'd best leave to an experienced technician. Zero in on the problem at the component level, and you can save mucho dinero by telling the technician to replace a single chip rather than an entire board.

The book does have a few minor faults. Corrupt system

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software can mimic a hardware failure at boot-up time, and Pina doesn't point out this "gotcha" anywhere in the book. Also, while the book claims that it's not a repair guide, it still should include warnings about the hazardous voltages present in the compact Macs and in all color monitors.

Nonetheless, the book does teach basic troubleshooting techniques, such as reviewing what you did to the machine last, and what events occurred up to the point of failure. While by no means perfect, *The Dead Mac Scrolls* serves as a first line of inquiry before you hand over your computer to a repair technician.

—Tom Thompson

BUILD YOUR OWN OR UPGRADE?

Build Your Own 386/386SX Compatible and Save a Bundle, Aubrey Pilgrim, Windcrest/McGraw-Hill, 1992, $18.95, 227 pp., ISBN 0-8306-3750-8.

The Winn L. Rosch PC Upgrade Bible, Winn L. Rosch, Brady Books, 1991, $26.95, 621 pp., ISBN 0-13-932252-3.

Do you have an old Compaq or IBM AT kicking around that's not doing anything useful? Aubrey Pilgrim's *Build Your Own 386/386SX Compatible and Save a Bundle* and *The Winn L. Rosch PC Upgrade Bible* help you explore your choices.

Pilgrim touches on every aspect of assembling a PC clone from parts or upgrading that old clunker. Most of the book presents an overview of the major components in a 386 PC clone. Pilgrim's recommendations for buying components are sound, and if you choose a standard full-size desktop case, you're in luck.

The book includes excellent photos to take you through assembly and testing. Different case designs and components will fit differently, however, and Pilgrim doesn't offer much help there.

Pilgrim's book makes several excellent upgrade suggestions, not the least of which is to consider finding a good home for your old machine and build a new one. Contrary to the book's title, building your own PC from scratch doesn't always make sense. You can usually buy a mail-order clone for less than the cost of buying all the parts separately. You can, however, pick and choose your components.

Winn L. Rosch's *PC Upgrade Bible* is a comprehensive volume with descriptions of just about every part of your PC and general procedures for making it bigger, faster, and more colorful. Make it through this book, and you'll have a solid background on everything PC, from motherboards to optical drives to mice.

The book doesn't offer step-by-step upgrade photos, but it does include many diagrams. Rosch's best advice comes on page 17: "The best reason for not making an upgrade is that you can often get someone else to do it for you." The store you bought the parts from is likely to install them for next to nothing just to make the sale.

Both books are best suited to computer novices, yet both trivialize the process of selecting and installing an upgrade. Also, neither offers much help when you install that fancy SCSI card and the machine won't boot. Unfortunately, upgrading a PC often requires more than a screwdriver and 10 minutes of your time.

—Howard Eglowstein

HIGH TECH AT YOUR FINGERTIPS



McGraw-Hill Science and Technology Reference Set, $495.

From "aaa disease" to "ZZ ceti stars," if it concerns science or technology, you'll probably find it in release 2.0 of the McGraw-Hill Science and Technical Reference Set on CD-ROM. The reference set includes every definition from the *McGraw-Hill Dictionary of Scientific and Technical Terms* and a condensed version of the 20-volume *McGraw-Hill Encyclopedia of Science & Technology*. That adds up to 117,000 definitions, 7700 articles, 1700 photos and line drawings, and a rich mix of tables, charts, and diagrams. It's available from the McGraw-Hill Professional Book Group, 11 West 19th St., New York, NY 10011, (800) 262-4729.

The navigational tools let you use the search technique best suited to your needs. You find terms by entering a search query from the keyboard or by expanding and collapsing an alphabetical outline of the CD-ROM's contents. Select a broad topic such as "genetics" and explore any of the entries that fall within it. A new Mirror of the Cosmos graphics screen lets you select topics from a graphical interface. An apple tree represents the biology topic, with each apple labeled with a subcategory such as biochemistry, cell biology, or ecology conservation.

Once you've found a term, you browse through the text, go back to the outline, or select a hypertext link. While reading the entry on stellar evolution, you double-click on a hypertext link to learn more about black holes. From there, you find a link to the theory of relativity. Only highlighted entries support hypertext links, but you can double-click on any term to find its meaning in the dictionary. You click on color-coded references to see illustrations and other graphical aids. You can set a "bookmark" to jump back to an item later, print the article, or copy it to your local hard disk.

The text is clear and accessible, although I did come across stilted prose on occasion. The entry for hallucination, for example, defines the term as "an involuntary sensory experience of objectively nonexistent phenomena," when "seeing things that aren't there" might do.

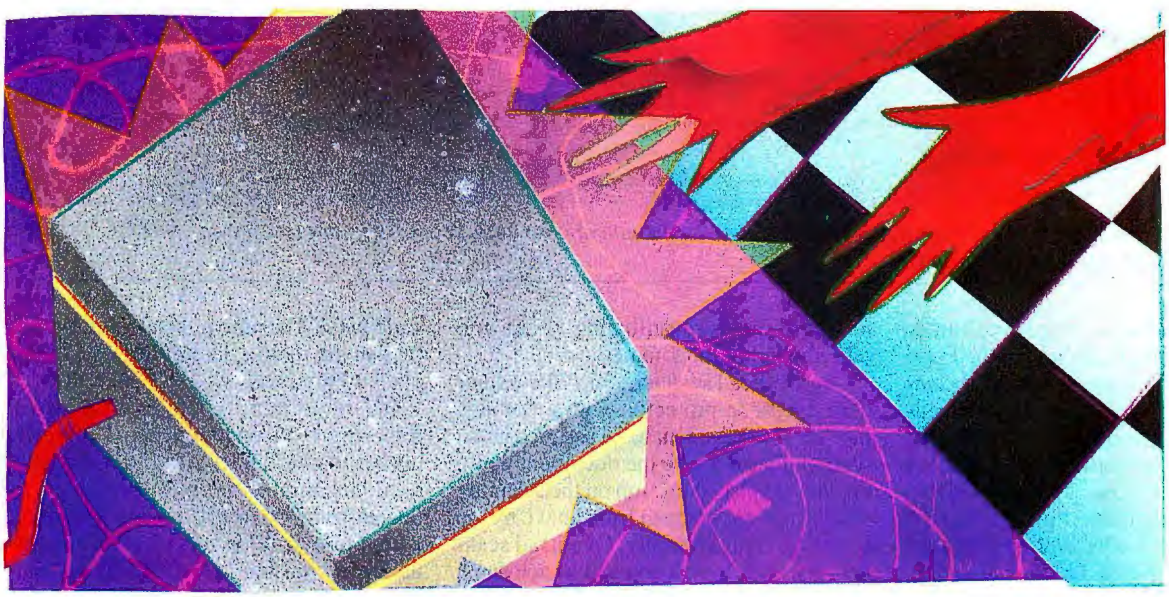
More disappointing are the graphics, which consist of simple line drawings, black-and-white photographs, and scanned formulas. Although they're informative, they're not visually stimulating. There is, for instance, a telescopic photograph of Jupiter—in black and white. Color graphics and a wider variety of visuals would make the content more appealing.

Nevertheless, I consider the McGraw-Hill Science and Technology Reference Set a fundamental research tool. It places volumes of scientific and technical data at your fingertips.

—Stanford Diehl

ROGER C. ALFORD

HOW SCANNERS WORK



New techniques make color scanning better and more affordable than ever before

Scanners that enable you to easily incorporate line art, photos, and other graphical images into documents are becoming increasingly popular. The features and capabilities of these once-expensive peripherals have continued to grow with advances in technology, while prices have followed the downward trend that has become the trademark of the computer industry. Indeed, technological advances have been key in improving resolution and overall image quality—of color images in particular. High-volume scanner use in fax machines has also helped advance the technology.

In this article, I'll take a close look at how scanners work and the different ways that technology is being applied to solve technical problems. I'll also look at how scanners interface to personal computers—generally PCs or Macintoshes.

A Brief Background

Around 1987 there was a mass move from simple black-and-white (or *bilevel*) scanners to the more sophisticated gray-scale scanners. Bilevel scanners could scan only line art and similar two-tone drawings. They were unable to generate any true gray-scale output, although many produced a simulated gray scale by reducing their resolution and generating patterns of black dots and white space to simulate gray levels. This process is known as *dithering*.

Gray-scale scanners maintain the maximum resolution of the earlier bilevel models, but they can assign a gray-level value to each pixel. A gray-scale scanner supports 16, 64, or 256 shades of gray by assigning a 4-, 6-, or 8-bit code to each scanned pixel. Today, these devices represent the biggest share of the scanner market.

Last year was the year of the color scanner. While some color scanners were available before then, 1991 ushered in an era of more choices, a variety of different technologies, and free-falling prices. In the past year and a half, color scanners have achieved important quality and speed improvements and have prices that now make them affordable for many users.

Scanner resolution also improved during this evolutionary period. While the resolution of earlier scanners topped off at 200 to 300 dots per inch, the standard maximum resolution of most modern scanners is now 400 dpi, and some offer up to 800 dpi. With most scanners you can specify the resolution of a scan; 75, 100, 150, 200, 300, and 400 dpi are the common options.

Using a software technique called *interpolation*, many 400-dpi scanners now offer enhanced resolution of up to 800 dpi or even 1600 dpi; this can result in smoother curves and less-jagged diagonal lines in scanned images. Interpolation is accomplished by an "intelligent-guess" algorithm to determine the probable pixel values of those

ILLUSTRATION: JOHN NELSON © 1992

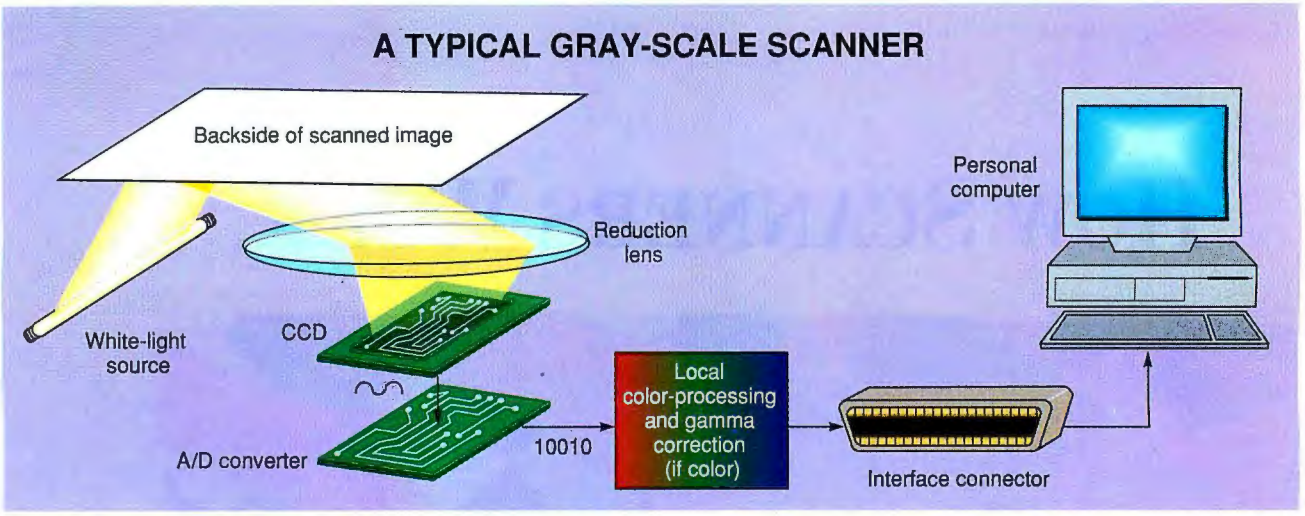


Figure 1: *A reduction lens focuses white light reflected from the document onto a CCD (charge-coupled device). The CCD's light sensors output voltages to an A/D converter.*

pixels between those that are actually scanned. For example, if one scanned pixel has a gray-level value of 48 and the adjacent scanned pixel has a gray-level value of 76, the software would guess that the unscanned pixel between these scanned ones must have a value of 62 ((48+76)/2). Inserting these estimated pixels into the scanned-image file effectively doubles the scan resolution in each direction (x and y), allowing, say, a 400-dpi scanner to generate an 800-dpi scanned-image file. This same technique can be extended for even higher effective resolutions.

Types of Scanners

There are two primary types of scanners: hand-held and desktop. To scan an image with a hand-held scanner, you drag it across the image you want to scan. Typical hand-held scanners use a 4-inch scan width, but some of them reduce their scan width as the scan resolution increases.

Desktop, or page, scanners, of course, generally remain on a desk, and they are capable of scanning an entire 8½- by 11-inch or 8½- by 14-inch page. There are three different flavors of desktop scanners from which to choose: flatbed, sheet-fed, and overhead. Flatbed scanners are the most versatile and generally the most expensive. These units function like a standard office copier: You place the document face-down on a glass plate and then scan it into your computer. This arrangement works for book and magazine pages as well as for single sheets.

Sheet-fed scanners work much like a standard fax machine. Single sheets placed into the top of the scanner are pulled through the unit as the image is scanned. This approach, of course, limits scanning to single sheets, disallowing books and other bound or thick materials.

An overhead scanner looks like a standard overhead projector, with a flat surface for the document to be scanned and a scanning head above the document. Documents are placed face-up on the scanning surface and are scanned from above by the scanning-head assembly. Overhead scanners generally have a nominal ¾-inch depth of field, which means they can scan certain low-profile three-dimensional objects.

The Resolution Dilemma

While they're not limited to this purpose, a common application of scanners is the capture of graphical images for incorporation into documents that are eventually printed on an office laser printer. In an attempt to achieve the highest-quality output, the natural tendency is to scan images at the highest allowable resolution and number of gray scales, or perhaps at the printer's 300-dpi output resolution. But the printed results are often disappointing.

What is not always immediately obvious is that, even at 300 dpi, a laser printer cannot produce the same level of effective resolution as the scanned image. This is because the scanned image has one of, say, 256 gray levels assigned to each pixel, while the laser printer is incapable of producing gray-scale dots; each printed dot is plain black, and unprinted areas are white (or the paper color if colored paper is used).

To achieve perceived grays, the printer must resort to dithering. This is accomplished by grouping dots together to create *gray-scale pixels*. Usually, a 2×2 (four dots), 3×3 (nine dots), or 4×4 (16 dots) matrix of dots will make up a single gray-scale pixel. The ratio of black dots to white dots in the matrix determines how dark a pixel's gray level is.

It's important to note that the use of dithering reduces the printer's effective output resolution. If a 2×2 dot matrix is used, the number of pixels per inch is reduced from 300 to 150. A 4×4 dot matrix, which allows 17 levels of gray, reduces the output resolution to 75 pixels per inch. To achieve a full 256-gray-level output (using a 16×16 dot matrix), the output resolution is reduced to a barely legible 18.75 pixels per inch. Thus, it may be better to scan an image at a lower resolution and number of gray levels at a faster speed to more closely match the output expectations of the printer. If you adjust the image with a graphics-manipulation program, however, you may need the higher scan resolution to achieve the best results.

There are times when you simply need a higher-resolution scan, such as when you want to print a page on a high-resolution output device, such as a Linotronic printer or typesetting system, or when you have to enlarge a scanned image before you print it. For example, if you scan a 2- by 2-inch graphic at a resolution of 300 dpi with 16 levels of gray, this would exactly match the ability of a standard laser printer to print the graphic as a larger 8- by 8-inch image using four dots per pixel, supporting the 16 levels of gray. The image will be four times larger in each dimension, at one-fourth the resolution. Of course, the new 600-dpi laser printers offer improved output quality for scanned graphics.

The main point here is that resolution isn't everything; you must consider the capabilities of your output device when scanning graphical images. When scanning text

for OCR (optical character recognition) applications, the general rule is, the higher the resolution, the better (although gray scaling is not needed).

Basic Scanner Operation

Figure 1 illustrates how a typical scanner works. The document being scanned is first illuminated by a fluorescent or incandescent light source. The reflected light goes through a lens and onto a photosensor called a CCD (charge-coupled device). The CCD is an IC that contains a row of tightly packed light sensors; the output voltage of each light sensor is proportional to the amount of light striking it.

A single scan line from the document is focused onto the CCD, and the output voltage of each light sensor is converted to a digital value (a binary bit pattern) by an ADC (A/D converter). A bilevel scanner actually uses a simple voltage comparator instead of an ADC and outputs either a black (0) or white (1) level for each light sensor. A gray-scale scanner will output a value that depends on the number of gray levels supported. A scanner that supports 64 gray levels, for example, outputs a 6-bit binary value; thus, the output value will range from black (000000) to white (111111).

The method used to advance to the next scan line varies with the type of scanner. A flatbed scanner moves its scan-head assembly; a sheet-fed scanner automatically moves the page across the scan head; an overhead scanner moves a reflecting mirror in its scan head; and a hand scanner, of course, is advanced when you manually move the scanner across the page.

Once the graphical image is in the computer, it is usually stored on disk in a standard file format—most commonly TIFF. The file can then be processed by graphics manipulation or OCR software as required.

Keep in mind that scanning can use up a lot of disk space. Scanning an 8- by 10-inch 256-gray-level image at 400 dpi, for example, creates a 12.8-MB file. The same image scanned with interpolation to 1600 dpi creates a disk-eating 204.8-MB file, and color images can require three times as much space.

Color-Scanner Technologies

As I mentioned earlier, most of the recent advances in scanner technology involve color-scanner design. As with color printers and color monitors, the design of color scanners is more difficult and involved than that of their monochrome (or gray-scale) counterparts. At least four different approaches currently exist for supporting color on scanners. In addition to the basic scanning operations described here, color scanners must also perform local color-processing and gamma-correction operations on the scanned dots before transmitting the information to the computer.

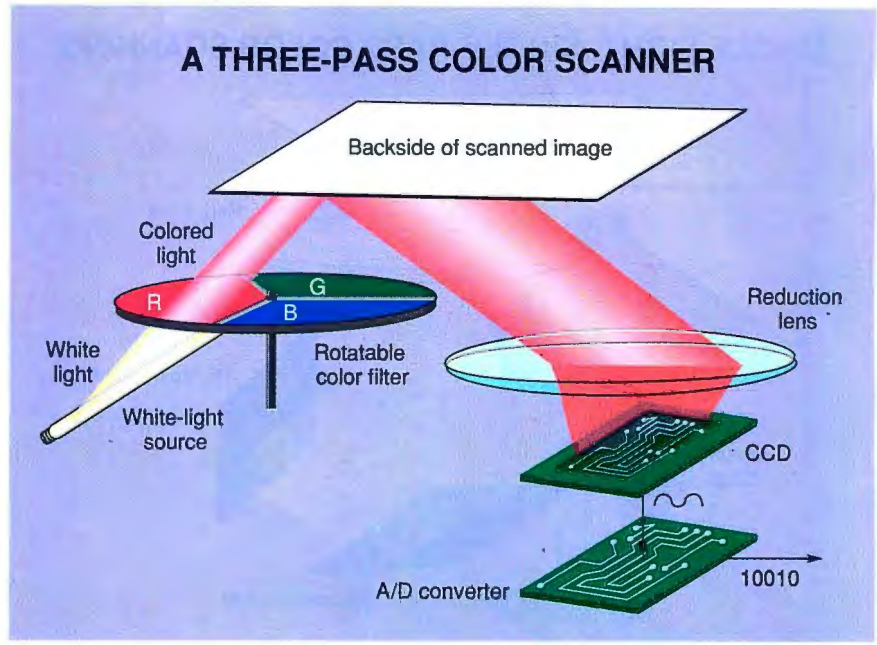


Figure 2: *For each scan line, a white-light source shines through red, green, and blue filters.*

The most basic color-scanner technology is illustrated in figure 2. A white-light source shines through a rotatable RGB filter assembly and onto the document being scanned, effectively creating selectable red-, green-, and blue-light sources. First, the red light shines onto the document, and the reflected light from the document is passed into the lens-CCD-ADC assembly, as in a conventional gray-scale scanner. The process is then repeated with the green and blue lights. Scanners from Microtek take this approach.

The net result of the three passes over the document is a composite RGB color-image file. If the ADC supports 256 levels (8 bits) of gray for each color scan, a standard 24-bit RGB color value is generated to represent each color pixel (for 16.7 million possible colors). If the ADC supports fewer gray levels, the number of bits available for each color pixel is reduced accordingly.

While this approach works reasonably well, it does have two potential drawbacks. First, the fact that three passes are required instead of one generally means the scan time will be much longer than that of a single-pass approach. The second potential drawback is pixel alignment between passes. Before you can obtain a good-quality composite image, all three passes over the document must be precisely aligned. If even one pass is off by a significant fraction of a pixel, tinting and other discoloration effects can be apparent in the scanned image. Mechanical adjustments are sometimes required to achieve the desired level of calibration.

Three-Light, Single-Pass Color

Another approach to supporting color on a scanner uses three separate light sources: red, green, and blue. The basic concept is the same as for the three-pass color approach described above except that the red, green, and blue lights shine in sequence for each scan line. Thus, the entire color document can be scanned in a single pass, alleviating any concerns of pixel misalignment. Epson and Sharp scanners work this way.

The only potential drawback to this approach is that the different light sources may have different decay characteristics, resulting in inconsistent color results over time. Overall, however, current designs are well implemented and provide a good-quality output in a single pass.

Single-Light, Single-Pass Color

Yet another approach to single-pass color scanning is illustrated in figure 3. A single white-light source shines onto the document, and the reflected light passes through a lens and onto a color-filter assembly. This filter assembly consists of a pair of *dichroic filter* assemblies that separate the white light into its red, green, and blue components.

continued

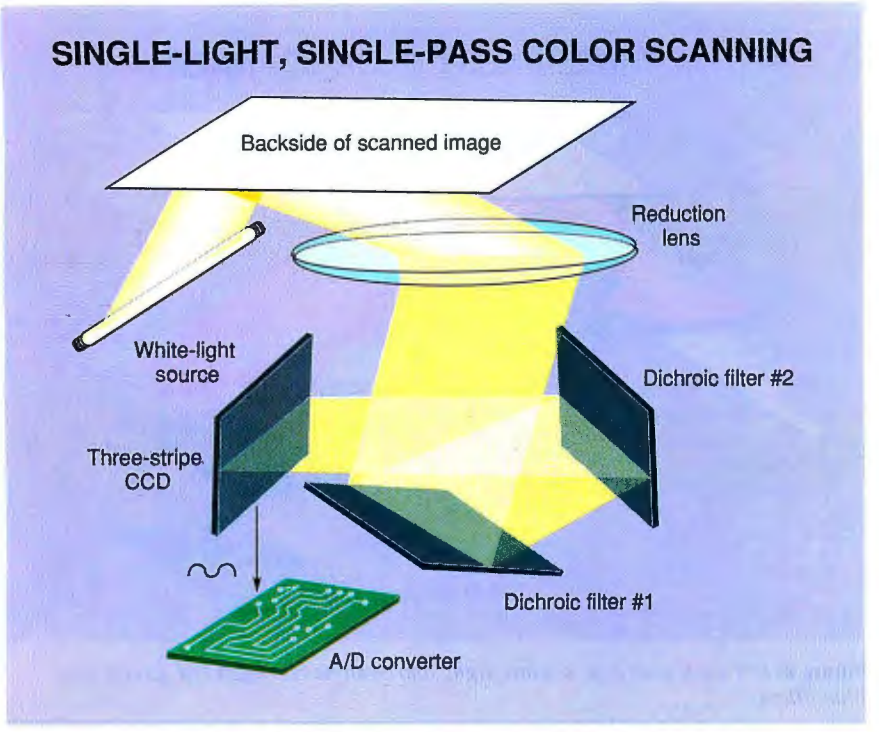


Figure 3: *Dichroic filters separate white light into its primary color components. Each separated color shines onto a row of a three-stripe CCD.*

The two dichroic filter assemblies each consist of two thin pieces of glass on top of a thick piece of glass. The two assemblies are similar, but they differ slightly. On the first assembly, the top piece of glass reflects blue light and allows red and green light to pass through; the second piece of glass reflects green light and allows the remaining red light to pass through; and the last piece of glass reflects the red light. On the second dichroic filter assembly, the top piece of glass reflects red light and allows the blue and green light to pass through; the second piece of glass reflects green light and allows the remaining blue light to pass through; and the last piece of glass reflects the blue light.

The light from the second dichroic filter assembly shines onto a special three-stripe CCD that has three rows of light sensors (instead of just one, which is the standard configuration). Each light-sensor element in the CCD is about 8 microns (i.e., millionths of a meter) square, and the three rows are each separated by a 200-micron gap. For the document row being scanned, each of the separated colors shines on one of the three CCD stripes, or rows. An ADC then converts the voltage level of each light sensor in each of the three rows into a digital value; the composite 24-bit RGB color value (assuming 8-bit conversions) is then transmitted to the computer.

This approach allows the scanning of color images in a single pass with a single consistent white-light source and with little chance of pixel-registration problems. The result is good color consistency in a relatively fast single-pass scan. The primary drawback of this approach is the complexity and associated cost of implementation, but recent technological advances patented by Hewlett-Packard have allowed the company to incorporate this design approach in the ScanJet IIC while maintaining competitive pricing. Ricoh uses a similar approach, but its design uses three separate CCDs.

Single-Light, Single-Pass Phototransistor Color

Seiko Instruments recently introduced its SpectraPoint color scanner for the Mac. Deviating from the standard CCD-sensor approach that is universal in the traditional scanner marketplace, Seiko's new offering features patented phototransistor sensors for color-image detection.

A special silicon substrate measuring the full width of the flatbed (8½ inches) contains 10,200 phototransistors, which are configured as three rows of 3400. Red, green, and blue filters are coated on the phototransistors themselves, so each row detects one of the three primary colors. With 3400 sensors in each 8½-inch row, there are 400 sensors per inch, allowing direct 400-dpi color scanning without the need for the lens-reduction technique used by conventional scanners.

Seiko claims its technology makes the SpectraPoint faster than conventional scanners and permits the scanning of a wider dynamic color range with better color fidelity. The SpectraPoint also has special circuitry that lets you adjust the color output of the scanner in real time to allow color-matching of scanned images to specific color monitors. A PC version is due around the middle of the year.

Scanner Interfaces

A scanner must have some physical link to the computer so it can transfer scanned image information to it. Hand-held scanners typically include a special interface card that plugs into an 8-bit expansion slot. Since almost all these interface boards require the use of interrupts, some are designed to be plugged into either an 8-bit or a 16-bit expansion slot, with the 16-bit slot allowing you to take advantage of the higher interrupts (IRQ10 and higher). Some of these boards also require a DMA channel.

It may take some effort to verify which interrupts and DMA channels are available and which are being used by other devices in your system, but knowing this before installing a scanner interface board and configuring the board accordingly can save you a lot of grief.

A large majority of the other types of scanners use a SCSI connector for connection to the computer. This interface is integral to the Mac and can be installed in a PC as a plug-in card. Many scanners also support a NuBus interface for Macs.

As the typical personal computer user's desktop continues to become increasingly graphics oriented, the number of scanners residing next to desktop computers will continue to increase. The benefits afforded by reliable OCR will have a rising impact on database applications. The popularity of Windows and the recent onslaught of affordable, quality color scanners will give an even bigger boost to the scanner industry, and new advances in scanner technology will continue to improve functionality and push down prices. ■

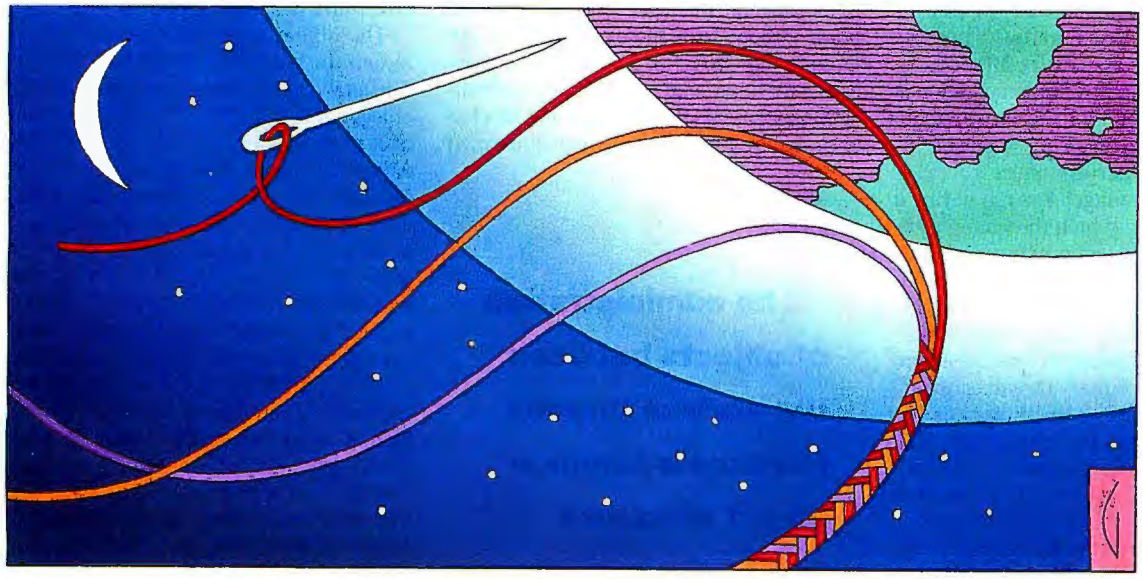
ACKNOWLEDGMENTS

I would like to thank Steve Ivy and Gerry Meyer of Hewlett-Packard and Rajeev Venkatapuram of Seiko Instruments U.S.A. for their generous assistance during the preparation of this article.

Roger C. Alford, a BYTE consulting editor, is president of Programmable Designs, a Michigan-based electronics design firm. He can be reached on BIX as "rogera."

CHARLES J. NORTHRUP

IT'S A MULTITHREADED WORLD, PART 2



Multithreading techniques add speed and simplicity to application designs

Last month, I discussed the importance of understanding how to program for multithreaded operating systems such as Solaris, Windows NT (New Technology), and OS/2 as MS-DOS begins its slow but inevitable decline. I explored the use of threads and semaphores and introduced ADAM, a dynamic attribute manager that handles the administrative aspects of data modeling. ADAM also illustrates multithreading techniques that simplify application design and speed performance. This month, I'll go into more detail, discuss ADAM's main program listings, and offer ideas on how you can customize ADAM.

Overview of ADAM

The attribute manager administers attributes that describe an object's characteristics. It executes as a separate thread from the application's primary thread and remains idle until the application attaches or detaches an attribute to or from an object. Only then does the attribute manager thread become active and perform the required task.

An attribute consists of a unique name and value. The attribute manager uses the name to locate it. The attribute's value may be predetermined (*intrinsic*), or it may be *derived*. The application knows an intrinsic attribute value; it does not require any event to determine it. Once attached to the object, the intrinsic attribute value does not change. A simple example of an intrinsic attribute is the mathematical equation $\pi = 3.145$.

An event is required to determine the value of a derived attribute. Derived attribute values can change over time, and they each have an associated attribute procedure. When the application attaches an attribute to an object, the attribute manager spawns a thread to execute the attribute's procedure.

A derived value is a function of its procedure, of time, or of its value. When the value is a function of its procedure, the derived value is the returned value from that procedure. When it's a function of time, it changes over time. When it's a function of its own value, the attribute manager passes the current value to the attribute procedure; the procedure then uses this value to determine a new value. This sounds confusing, but it should fall into place with a few examples.

Consider an attribute, called `IDLE_TIME`, whose value represents a network computer's free time. This attribute can't be intrinsic, since the attribute procedure has to calculate its value to accurately determine how busy (or free) the machine is. Therefore, I need to write a function (call it `CalcIdleTime`) to compute the value. This function is the attribute's procedure. I now know that the attribute name is `IDLE_TIME`; that it is a derived attribute; and that it has an attribute procedure named `CalcIdleTime()`.

Next, I need to know how much time should expire between computations of this value. If the `IDLE_TIME`

ILLUSTRATION: JOSEF GAST © 1992

Listing 1: `Object.h`, *the generic object format definition.*

```
typedef struct _OBJECT {
        void            _far *Data;
        ATTRIBUTEVIEW           AttributeView;
        RESOURCE                Resource;
} OBJECT;
```

attribute value has to be recomputed every 30 seconds, how can I write this in a sequential algorithmic approach? I can include a `timer()` that signals the process to recalculate the value every 30 seconds. The disadvantage to this implementation is that the primary thread itself must handle the `timer()` interrupt. This seems harmless, but it affects performance.

The attribute manager lets me define a time period during which the value is acceptable. After this time expires, the attribute manager spawns a new thread to execute the attribute procedure, thus recalculating the value. In this implementation, a separate thread performs the actual computation; the primary thread is not affected. This example also illustrates the concept of software partitioning, in that the algorithm associated with the primary thread remains intact and is not distorted with code to handle the interrupt timer.

Through the attribute manager, an application can attach and detach arbitrary attributes to and from an object. By attaching an attribute to an object, the application has determined that the object has the particular characteristic that attribute represents. The number of attributes that it can attach to an object at any given time is limited only by the number of defined attributes: Each attribute has a unique name, and the application can attach only one instance of a particular attribute to the object at a given time. Note that attributes attach to the object, not to its representative data. From the attribute manager's perspective, there is no relationship between the attribute and the content of the data.

The attribute manager's design lets the user define attributes in addition to those the application defines. User-defined attributes always have an intrinsic value. The user can then attach or detach these newly defined attributes to or from any object within the application. The application's primary thread attaches and detaches attributes, but attribute procedure threads created by the attribute manager determine the values (when necessary).

Design Requirements

Sections of ADAM's design requirements detail source code used in an implementation for OS/2 1.3 using Microsoft C 6.0Ax. The listings included in this article provide the base for a minimal implementation of the attribute manager. The listings compiled without error and executed on a 386 PC running OS/2 1.3. I've included many hooks for additional functionality and other enhancements that you can add at a later time. I minimized the listings presented here so as not to inundate you with bells and whistles; my intention is to help you understand the basic concepts and functionality. [Editor's note: *Listings in text are abbreviated. An expanded and fully commented version is available in electronic format. See page 5 for details.*]

The administration of objects between the various threads requires a common object structure.

The attribute manager consists of the `attributeManager()` thread and the `attributeTimer()` thread. Both are invoked when the application's primary thread calls the `attributeManager()` function with parameter `START_MANAGERS`. The attribute manager then invokes itself and the attribute timer as separate threads. Upon success, `attributeManager()` returns a zero to the primary thread. At this point, three threads are running: the primary thread, the attribute manager thread, and the attribute timer thread. Regardless of when the application starts the attribute manager and attribute timer, it is responsible for their termination. To terminate the attribute manager, the primary thread calls the `attributeManager()` function with parameter `STOP_MANAGERS`.

The administration of objects between the various threads requires a common object structure. It must include a pointer to the object's representative data, a `RESOURCE` member for change control, and a pointer to the object's `ATTRIBUTE VIEW`.

The object requires a `RESOURCE` for synchronizing access to its information. In particular, if an attribute procedure is to modify the object's representative data, then it must first gain control of the object's semaphore. This prevents a procedure from releasing resources that another procedure is using.

The object's `ATTRIBUTE VIEW` represents the linked list of attached attributes. The attached attributes are members of the object's `ATTRIBUTE VIEW`. Each member of a view always consists of a member data structure containing a pointer to the next and previous members in the view.

In your implementation, you may wish to add two bit-mapped `SET`s to the object—one for the `COMPLETE` attribute set, and the other for the `DERIVED` attribute set. A `SET` is a bit-mapped representation expressing those members belonging to a set. Each attribute has a unique numeric identifier. Therefore, if attribute 154 is attached to an object, the 154th bit in the `COMPLETE` attribute set would be 1; otherwise, it would be 0. This, however, enforces the restriction of an upper boundary on the number of attribute types supported. The `SET` must be able to accommodate all attributes in the application domain and all user-defined attributes.

For performance considerations, the object should maintain two distinct sets: one for the complete set of all attributes attached to the object, and the other for those attributes whose values have been derived. Note that the derived set is a subset of the complete attribute set.

User-defined attributes begin at the next increment from the largest application-domain attribute identifier value. The attribute manager lets the user define additional attributes, provided that it can add the attribute type identifier to the `SET`. The advantage of implementing a `SET` is strictly in the execution time. Using a `SET`, you can apply several simple operations, preventing the need to traverse the entire attribute list associated with an object.

The common object data structure appears in the object header file in listing 1. You can implement a simple routine to create a basic object to allocate the memory for the object structure and perform some basic initializations, such as setting the default values to `NULL`.

Designing the Attribute Manager

The attribute manager evaluates attributes that the application attaches to an object. It

Listing 2: *A partial listing of* `attr.h`*, the attribute type definitions.*

```
#ifndef TOOLS
#      include "tools.h"
#endif

#define START_MANAGERS 0
#define RUN_MANAGERS   1
#define STOP_MANAGERS  2
#define MAXATTR        15

DEFINE_VIEW(   ATTRIBUTE );
DEFINE_MEMBER( ATTRIBUTE );

typedef enum   {
        PROCEDURE, TIME, VALUE, NA,
} FUNC_OF;

typedef union {
        unsigned int    Integer;
        unsigned long   Long;
        unsigned char   Character;
        void    _far    *Pointer;
} ATTR_VALUES;

typedef struct {
        FUNC_OF          FunctionOf;
        unsigned long    Period;
        signed short     Tid;
        signed long      NextRecalc;
        ATTR_VALUES      (*AttachProcedure)();
        ATTR_VALUES      (*DetachProcedure)();
} DERIVED;

typedef struct {
        enum    {
                    INTRINSIC, DERIVE
                } ValueType;

        enum    {
                    COMPUTE, COMPUTING, COMPUTED,
                    INCOMPLETE, INVALID, TMOUT
                } Mode;
} ATTR_MODEL;

typedef struct _ATTRBASE {
        unsigned long    Id;
        ATTR_VALUES      Value;
        ATTR_MODEL       Model;
        CONSTRAINTS      Constraint;
        DERIVED          Derived;
} ATTRBASE;

/*-----------------------------------
  ATTRIBUTE Type Definition

  Configuration:    The basic attribute
                    information.
  Resource:         A resource type definition to
                    control updates to this
                    attribute.
  OwnerObject:      A pointer to the object for
                    which this attribute is
                    attached.
  AttributeMember:  A member of the view for all
                    attributes with this same Id.
  DerivedMember:    A member of the view of all
                    attributes whose values are
                    derived.
  ComputeMember:    A member of the view of all
                    attributes whose values must
                    still be computed.
  ComputedMember:   A member of the view of all
                    attributes whose values have
                    already been computed and are
                    available to the application.
  ObjectMember:     A member of the view for all
                    attributes attached to the
                    given object.

  -----------------------------------*/
typedef struct _ATTRIBUTE {
        ATTRBASE          Configuration;
        RESOURCE          Resource;
        struct _OBJECT   *OwnerObject;
        ATTRIBUTEMEMBER   AttributeMember;
        ATTRIBUTEMEMBER   DerivedMember;
        ATTRIBUTEMEMBER   ComputeMember;
        ATTRIBUTEMEMBER   ComputedMember;
        ATTRIBUTEMEMBER   ObjectMember;
} ATTRIBUTE;

typedef struct _ATTRENTRY {
        ATTRBASE           DefaultAttribute;
} ATTRENTRY;

/*-----------------------------------
 ATTRIBUTE TABLE Type Definition
 The attribute table is the base of the default
 attribute information. This includes the
 following:
 ComputeView:      The view of all attributes whose
                   values are computed.
 ComputedView:     The view of all attributes whose
                   values must be computed.
 DerivedView:      The view of all attributes whose
                   values are derived by some
                   function.
 ConstraintView:   The view of all attributes
                   whose values are under some
                   constraint.
 EntryCount:       The number of attributes
                   maintained in this table.
 Entries:          An array of attribute entry
                   descriptions.
 -----------------------------------*/
typedef struct _ATTRTBL    {
        ATTRIBUTEVIEW       ComputeView;
        ATTRIBUTEVIEW       ComputedView;
        ATTRIBUTEVIEW       DerivedView;
        ATTRIBUTEVIEW       ConstraintView;
        unsigned long       EntryCount;
        ATTRENTRY           Entries[MAXATTR];
} ATTRTBL;

   unsigned short
attachAttribute(OBJECT *Object, unsigned
                short Id, ATTR_VALUES *Values);

   unsigned short
attributeManager(unsigned short Phase);

   void
attributeTimer(void);

   unsigned short
detachAttribute(OBJECT *Object, unsigned
                short Id);

   ATTR_VALUES *
getAttributeValue(OBJECT *Object, unsigned
                short Id);

END
```

executes as a separate thread invoked by the application's primary thread. The manager synchronizes updates to the object's resources, when appropriate, by requesting exclusive use of the object's change-control semaphore. This thread terminates when the application's primary thread calls the `attributeManager()` function with parameter `STOP_MANAGERS`.

The attribute manager requires the `attr.h` header file shown in listing 2. This listing contains numerous type definitions that describe the components of an attribute. While these can be consolidated into only a few type definitions, I chose the more detailed approach for readability. Each type definition includes detailed commentary describing the components of the type and the overall use for it.

Note the definition for `ATTR_VALUES`, which is a union representing all the possible types of attribute values for this implementation. When implementing this on your machine, be sure to change the `ATTR_VALUES` to include any new definitions that your application requires. All attribute procedures return type `ATTR_VALUES`, which is then assigned as the attribute's value.

The `DERIVED` type definition details the information required to support derived attributes. This includes the period and the name for the attribute procedure, which computes the attribute's value. When the attribute manager invokes this procedure, `Tid` contains the attribute procedure's thread identification number. The `getAttributeValue` function uses `Tid` to boost the thread's priority when the application needs a value that's not yet available. Retaining `Tid` with the attribute also lets the attribute manager suspend the thread when necessary. `Period` details the amount of time that can expire before the program has to recompute the attribute's value. `NextRecalc` contains the time after which the attribute timer must recompute the value.

The attribute model is a type definition containing the enumerated `ValueType` and `Mode` members. `ValueType` indicates whether the attribute is `INTRINSIC` or `DERIVED`. Remember that an `INTRINSIC` attribute value is defined on creation of the attribute as either a default predefined value or a value passed to the `attachAttribute()` function. An attribute's procedure computes its `DERIVED` value. The procedure may recompute its `DERIVED` value periodically if the attribute has a defined time period. `Mode` is an enumerated type representing the currency of the value; that is, it represents when the value is available to the application.

The `ATTRBASE` type definition defines the minimum information required for an attribute. Separating this from the additional administrative information needed for an attribute makes it easier to initialize the attribute in the `attachAttribute()` function. This function can use the size of an `ATTRBASE` type in a single `memcpy()` to initialize the static attribute definition instead of assigning one field at a time.

The attribute manager maintains four views as part of the attribute table.

This minimum information includes the attribute's `Id`, given as a unique identifier for the attribute type.

The implementation could use character strings to identify the various attributes, but this would lead to poor performance as a result of numerous string comparisons. Using a numeric representation for the type permits a simple implementation of set theory to express the attributes attached to a given object. For this implementation, I use an `unsigned short` for the attribute `Id`, providing a reasonable number of available attribute type definitions.

The `ATTRIBUTE` type definition itself contains an attribute base, a resource, and several administrative members. The attribute manager uses the resource for exclusive rights to update the attribute. A thread requires ownership of the attribute's resource to modify its value or perform administration on the attribute. In general, any modification of the attribute requires ownership of its resource.

The `ATTRIBUTE`'s `OwnerObject` is a pointer to the object to which this attribute is attached. The attribute manager uses this for administrative purposes.

`ObjectMember` is a data structure containing a pointer to the next attribute attached to this object. It also maintains a pointer to the previous attribute in the list of attached attributes. This list is maintained from the object's perspective, representing those attributes currently attached.

The `AttributeMember` linked list also contains a pointer to the next instance of an attribute with this same `Id` (attribute type) and contains a pointer to the previous instance of this typed attribute. However, it is maintained from the attribute manager's perspective, not the object's. The attribute manager must locate all instances of the same typed attribute and maintain the `AttributeMember` list for performance reasons. Be careful not to confuse it with the `ObjectMember` linked list.

The last type definition introduced in listing 2, `ATTRTBL`, is the basic definition for the attribute table entries, which the attribute manager maintains. For each attribute type defined, the attribute table's `Entries` array holds one entry, and the attribute `Id` gives the row index. For clarity, the attribute table as implemented here includes all the information for a generic prototype attribute. The entry also contains the pointer to the attribute procedure.

The attribute manager maintains four views as part of the attribute table. `ComputeView` shows all attributes whose values require computing. `ComputedView` is for all attributes with computed values. `DerivedView` shows all attributes whose values are periodically derived. `ConstraintView` contains all attributes whose values are under a constraint.

The `attachAttribute()` function attaches new attributes to an object. The main thread calls it and passes a pointer to an object, the identifier of the attribute to be attached, and an initial value (if the attribute model is `INTRINSIC`). The initial value may be `NULL`, in which case the `attachAttribute()` function uses the default value from the attribute table. After validating the parameters, the function must allocate memory for the new attribute instance and initialize it using the default values from the attribute table. The function must add this new attribute instance to the object's view of attached attributes.

The `attachAttribute` function sets an intrinsic attribute's mode to `COMPUTED`, since no additional work is required to determine the attribute's value. It then adds the attribute to the attribute table's `ComputedView`.

The attribute manager handles a derived attribute a little differently. If you specify a time period for the attribute value, then the `attachAttribute` function adds the attribute to the attribute table's `DerivedView`. It must also add this attribute to the attribute table's `ComputeView` to ensure that the attribute manager computes the value at least one time. The `attachAttribute` function then sets the attribute's mode to `COMPUTE`.

The `attributeManager()` function performs one of three distinct tasks, or phases, depending on the value of the parameter passed to it. During the `START_`

MANAGERS phase, the function starts the attributeManager() as a separate thread with the RUN_MANAGERS parameter. Also during this phase, the attributeManager function starts the attributeTimer() as a separate thread. On completion of this phase, three threads are ready for execution: the application's primary thread, attributeManager(), and attributeTimer().

To terminate the attribute manager, the application calls it with STOP_MANAGERS. This sets the RunManagers variable to FALSE. The attributeManager() and attributeTimer() threads then fail the while(RunManagers==TRUE) test and terminate.

During the RUN_MANAGERS phase, the attribute manager spends its time examining the view of all attributes with mode COMPUTE. The attribute manager knows that it must compute the value of every attribute that is a member of this view. To do so, it must first remove the attribute from ComputeView and set its mode to COMPUTING. It locks the attribute's resource to show that it is changing the value and then begins another thread to execute the attributeProcedure() function.

This function, running as a separate thread, calls the attribute's defined procedure and assigns the returned value to the attribute. The function then sets the attribute's mode to COMPUTED and adds the attribute to the view of all computed attributes. Finally, it unlocks the attribute's resource and terminates the attributeProcedure's thread.

The application calls the getAttributeValue() function, which examines the value of a given attribute. By examining the view of all attributes attached to a given object, it can easily find the attribute in question. You should, however, be ready to address a few issues. Specifically, what happens when the thread to compute a derived attribute value has not been started or is still running?

The getAttributeValue() function tries to lock the attribute. If it can't, it assumes the attributeProcedure() is still running and increases the thread's priority. If it can lock the attribute, it then must see if the mode is set to COMPUTE. If so, attributeManager() has not yet started the attributeProcedure(), and the program temporarily boosts attributeManager()'s priority. When the function has successfully locked the attribute and the mode is COMPUTED, the function can return the attribute's value. On failure, the function returns NULL.

The detachAttribute() function is the last procedure required for a minimal attribute manager. This function examines the list of currently attached attributes for the attribute Id specified. Then it uses the REMOVEMEMBER macro to detach the attribute from the object (i.e., remove it from its view). The function must also remove the attribute from the attribute type view maintained as part of the AttributeTable. Note that it would be more efficient to test the object's complete attribute SET to determine whether the attribute is currently attached to the object.

You can enhance ADAM for particular applications.

Establishing Attribute Procedures

The actual attribute procedures and the attribute type information are defined in attrfunc.h and attrfunc.c, found in the full version of the listings (available electronically). The header file contains some constant value definitions for the attribute types. I introduce only three attribute types; although they're not extremely useful, they provide an easy example of how to implement attribute types. The tunable parameters for the attribute manager may change from one application to the next.

The attribute procedures, along with the AttributeTable, appear in the attrfunc.c module. These procedures return an ATTR_VALUES, since they assign the value to the attribute. Depending on the multithreading APIs your operating system uses, it may be easier to implement the value assignment within the procedure. Note, however, that the procedure must also set the mode and clear the attribute's semaphore in this situation.

The attribute table definition also appears in the full version of the listings. The static initialization provides a simple example of how to define the table. Some of the information provides the default values when the attachAttribute() function creates the attribute. If you change the table definition, be sure to update the attach function to provide proper initialization. An enhancement to the basic attribute manager might use an attribute dictionary with predefined attributes that are pulled in only when needed.

The AttachAttribute() and DetachAttribute() functions can attach to or detach from an object, respectively. The process of attaching an attribute results in the new substantiation of the attribute using base rules for the default attribute settings. When the application calls the DetachAttribute() function, it loses all references to that particular attribute's instantiation.

Note that, due to the time-slicing/priority schema of the OS/2 scheduler, the expiration of a derived attribute's period may not cause immediate recalculation of its value. However, the attribute timer thread will find the attribute's value to be out of date the next time this thread executes.

Enhancements

I've left plenty of room for enhancements to ADAM, but I've made no provisions for derived user-defined attributes. All user-defined attributes, by default, use INTRINSIC modeling. You can enhance ADAM for particular applications, and these enhancements could include support for attribute dependencies, integrity constraints for attribute values, shared attributes, and even an attribute dictionary.

Attribute dependencies arise when an object has a particular attached attribute and—solely because of that attribute—you can attach another attribute. You have formed a dependency when you would receive an error if you attached the second attribute without the first.

Consider an object representing a person, for example. An attribute of this object might be the person's gender. If you attach the "Male" attribute, you can then attach an "Adam's Apple" attribute. The second attribute is describing a characteristic of the person attribute, not the object. This leads to an attribute hierarchy. The attribute manager as implemented here does not support dependencies, but you can easily add it.

Integrity constraints between attributes, as defined by CACTIS, state that a Boolean relationship between two attribute values must evaluate to TRUE or one (possibly both) of the values must be recalculated. An integrity constraint would offer significant benefits, and you can easily add it. I have given the type definitions in listing 2. To implement the constraint functionality, modify the attributeProcedure() function on return from the attribute's defined procedure call. You can also add a value-check constraint so that when the attribute value does not meet the value check condition, the attributeProcedure() function immediately detaches from the attribute.

Yet another enhancement might support an attribute shared by one or more

Circle 85 on Inquiry Card.

objects. Since the application object's data is independent of the attribute, it could share an attribute between one or more objects.

The full version of the listings contains a program stub for the `main()` function, which creates an object and then attaches the three attributes defined in `attrman.c`. I compiled the program, along with the `attrman.c`, `attrfunc.c`, and `resource.c` (see listing 1 of last month's Some Assembly Required) with Microsoft C 6.0Ax using the compile options

```
cl -c -AL -Ox -I
```

and linked using

```
link /PM:VIO main+resource+
attrman+attrfunc,,,LLIBCMT;
```

ADAM may seem complex, but its approach has many advantages. As operating systems that support parallel multitasking emerge, you'll need a well-defined methodology to take advantage of their power. ADAM takes you a step in the right direction. ■

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BARRY NANCE

ON-THE-FLY DISK COMPRESSION

How to transparently trim the fat from your PC's hard disk

Hard drive prices have come down quite a bit over the past year. Thus, squeezing every precious megabyte out of existing hardware is not the critical concern it once was. Still, the market for file-compression utilities is thriving, as more sophisticated applications deal with larger and larger amounts of data.

Some file-compression utilities (e.g., PKZip, ARC, and LHARC) operate at the command line and on an entire file at a time. Softlogic Solutions' Cubit operates on the fly, but it does so by decompressing the entire file when it is opened and recompressing the file when it is closed. Other products, such as Stacker from Stac Electronics, operate completely on the fly—decompressing during read operations and recompressing during writes.

This month, I give you an on-the-fly file compressor that I call Diet Disk. Like Stacker, Diet Disk operates at the level of file read/write operations. You load the DIETDISK.COM TSR program (which occupies about 24 KB of RAM) when you boot up your computer. You follow a few simple procedures, and you get back a large amount of disk space. I can't predict exactly how much you might get back; that depends on the contents of the data files you use. Some files are better candidates for compression than others. You'll also be interested to know that Diet Disk, although fast, is somewhat slower than Stacker (any compression operation, at any level, takes time to run).

Can I Trust It?

Diet Disk works with the applications I've used during testing, but I can't guarantee its operation in all possible situations. The DIET.DOC file that accompanies the software explains how you can test for compatibility with your applications. But as the documentation points out, a larger hard drive and uncompressed access may be the only way to put your mind at ease.

How It Works

Diet Disk intercepts DOS-file activity, handling calls that use file-control blocks as well as those that use file handles. To Diet Disk, each file is a collection of 2-KB segments. It treats each segment as a separately compressible entity. When an application program seeks into a file and reads a certain number of bytes, Diet Disk calculates the segments that it needs, reads the segments, decompresses them, and puts the result into the application's read buffer. When an application writes data, Diet Disk organizes the data into 2-KB segments, compresses each segment, and writes the compressed data into the file.

Diet Disk's compression and decompression modules are based on the LZW (Lempel-Ziv-Welch) compression algorithm. LZW (which is also used in PKZip, ARC, and Unix's `compress`) is a dictionary-based compression scheme that was first described by Terry Welch in an article called "A Technique for High-Performance Data Compression" (*Computer*, June 1984).

Diet Disk comes complete with source code. Whether or not you use it to conserve space on your hard disk, you'll find Diet Disk a helpful starting point for building TSR, file handling, and compression programs. ■

MAC/Tom Thompson

Managing Your Apple Menu

One of System 7.0's finer features is the opportunity it affords you to customize the Apple Menu. When you drop a document or application into the Apple Menu Items folder, it appears in the Apple Menu, where it's easily accessible.

Unfortunately, making the alias file and putting it in a folder inside the System folder involves a lot of clicking and dragging. Peter Kaplan's freeware AppleEase utilities provide an easier solution.

There are two components: AppleEaseIn is an application that creates the alias file and copies it to the Apple Menu Items folder. You simply drag the icon of the file, folder, or drive onto the AppleEaseIn icon, and it does the rest. AppleEaseOut is an extension that undoes the work of AppleEaseIn. Hold down the Option key when you select an item in the Apple Menu, and that file is moved back onto the Desktop.

UNIX/Ben Smith

Navigating Through Usenet News

Usenet News is a heterogeneous but anarchistic worldwide collection of computer users that generates more than 6 MB (some 6000 printed pages) of information daily. If you participate in Usenet, you can find the sheer volume of information overwhelming—even if you limit yourself to very few of the more than 600 news groups. Several important public domain news-reading programs have emerged in the last few years to help you navigate. The most notable are `rn` by Larry Wall (the same Larry Wall who wrote `patch` and `perl`) and `nn` by Kim Fabricius Storm of Denmark. Both programs are capable of extensive filtering and handle new messages with a variety of tools. Wall's `rn` is particularly strong in its regular expression operations. The strongest feature of `nn` is its organization of the subject threads within a news group. (Due to program size, these programs are not available on disk.)

Editor's note: *Software Corner highlights public domain, freeware, and shareware programs. The programs are available in electronic format. See "Program Listings" on page 5 for details. We solicit your contributions. We pay $50 for any program we use. Write to: Software Corner, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.*

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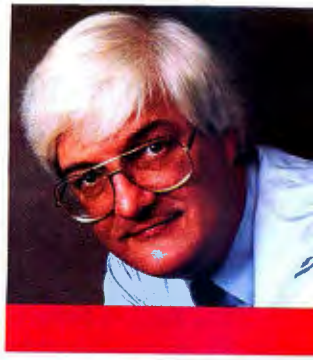
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BARRY NANCE

WINDOWS NT AND OS/2 COMPARED

IBM is now giving birth to OS/2 2.0, and Microsoft is still pregnant with Windows NT (New Technology). Thus, all comparisons of the two operating systems have to be taken with a grain of salt. However, Microsoft Press has published *The Windows 32-bit Guide to Programming*, which gives programmers an overview of what Windows NT will look like. Don't tell Microsoft this, but it also helps that I got a chance to see Windows NT in action, at one of the exclusive alpha sites, by looking over a friend's shoulder. Meanwhile, on the OS/2 side, IBM has kept me posted with frequent beta releases of OS/2 2.0 because I've been writing a book on that subject.

I'm immediately struck by the similarities between OS/2 2.0 and Windows NT. Both operating systems offer a flat 32-bit memory model (no more 64-KB segments); multiple threads; protection of applications from one another; DLLs and DLL-handling functions; named pipes; drag and drop functions; and DDE, clipboard data exchange, and similar memory allocation schemes. Microsoft is also rumored to be developing a 32-bit version of the DOS FAT (file allocation table) file system. If that happens, both operating systems will sport advanced file systems: OS/2's High Performance File System and NT's super FAT. Designed originally just for disk files, the DOS FAT file system may outlive both OS/2 and Windows NT!

Windows NT clearly benefits from work done at Microsoft on what was once the OS/2 3.0 project. However, it is a from-scratch effort that began at DEC several years ago under the direction of David Cutler. When DEC killed the project, the development team moved to Microsoft to complete its work. Cutler brought ideas—but no code—from DEC.

IBM and Microsoft thought of OS/2 3.0 as the "portable successor to OS/2." After IBM and Microsoft went their separate ways, Microsoft decided to layer a 32-bit Windows interface on NT in place of PM (Presentation Manager) and to customize NT in other ways.

Microsoft says it will offer the 32-bit Windows API with a future version of DOS and Windows, in addition to making the API available on the NT operating environment, but that's still controversial. Sources close to the NT team at Microsoft tell me that the NT developers themselves don't believe that "Win32 on DOS" will actually happen.

Measuring the Differences

Windows NT embodies a microkernel, layered architecture. This is an excellent way to design an operating system. Subsystems and modules attach to the base operating system on demand. I admire Microsoft for taking this approach. If Microsoft can prevent performance from suffering because of all the layers of modular code, it will have created a cleanly designed operating system that may very well last into the next century. Sluggish performance, however, would be the kiss of death for Windows NT, no matter how well it's designed.

Will Microsoft's new operating system be a better OS/2 than OS/2?



As you'd expect in a protected 32-bit environment, you can't do direct-port I/O under Windows NT. You can't modify the system date and time, nor can you read or write the Windows.INI files directly. Microsoft suggests that you review your structure member alignments in the new 32-bit world.

The Windows NT 32-bit API is an extension of the Windows 3.1 API. Programmers will have to make a series of adjustments to their code to compile the application for Win32. Specifically, `lParam` and `wParam` are both 32-bit (4-byte) fields. Windows 3.x usually packs a handle and another value into `wParam`. Windows NT changes the way the packing occurs. To retrieve WM_COMMAND messages, for example, you'll use macros that hide these packing differences. The new WINDOWS.H file also contains 32-bit `typedefs` for things like LPSTR, `hInst`, and `hWnd`.

Windows 3.x applications that make use of expanded or extended memory or that use the DOS function call INT 21 hexadecimal interface will need to be recoded slightly. Windows NT will run on the Mips R4000 RISC processor, which doesn't have expanded memory, extended memory, or INT 21h.

Every Windows NT application must register its own window classes. Thus, `hPrevInstance` always returns NULL under Windows NT. If you use `hPrevInstance` to determine when you should share data with an already-running instance of your application, you'll need to switch to some form of interprocess communication. As an alternative, you could call

ILLUSTRATION: NAN ROSSITER © 1992

`FindWindow()` to help determine which instance is which.

The Biggest Difference

To me, the biggest features of Windows NT are localized input and threaded-message queues. Windows NT will determine the ownership of a user's/operator's input at the time the input occurs, not when that input is extracted from a system message queue. Each thread will have its own message queue and its own input-synchronized-state information. The result is no more hourglass cursors. If one application fails to process its message queue quickly enough, other applications aren't affected. The other applications and their threads have separate message queues.

It's too bad that PM doesn't feature threaded-message queues. On the downside, however, Windows programs that call functions like `SetFocus()` and `GetCapture()` will have to change to accommodate localized input. For example, if you subclass a window control or try to detect nonclient mouse/window activity, you may need to rework your code slightly. In a Windows environment, it's difficult to deal with parent windows that don't have a separate window ID. Under PM, every window has a window ID, even top-level windows. The window owner and parent are separate. You can deal with and manage them individually. PM programmers don't need to use the WS_CHILD, WS_POPUP, and WS_OVERLAPPED styles you find in Windows programs.

The biggest features of Windows NT are localized input and threaded-message queues.

The Multiprocessor Angle

Windows NT will be able to run in a multiprocessor environment. High-end PCs with multiple CPUs will use Windows NT to advantage. You'll see the benefit of multiprocessing when Microsoft ports LAN Manager to run under Windows NT. But don't forget that Intel will announce the 586 chip later this year and that IBM has a special relationship with Intel. The 586 will embody multiple processors on a single chip. OS/2 will take advantage of the 586 soon after it's announced.

Microsoft has shown Windows NT running on Mips R4000–based computers as well as 386 and 486 machines. While IBM has made no public statements about OS/2 2.0 running on a RISC machine (e.g., the IBM RISC System/6000), I have a bit of personal knowledge. Last year, I visited IBM's Austin, Texas, facility. During a coffee break, I stuck my nose where it was not supposed to be and happened to see OS/2 running on a RISC System/6000.

Which Is Best?

OS/2 will require less-expensive hardware and will have better support for character-mode applications—something that NT supports but does not encourage. I expect that OS/2 will run DOS-based software better and faster. To run DOS software

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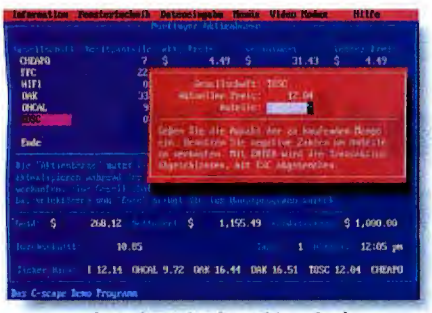
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under NT, Microsoft licensed an 80x86 emulator from Insignia Solutions. But 80x86 emulators are tricky. IBM quietly offers such an emulator on the RISC System/6000, called PC-Simulator. When I went to Austin, I was there to help IBM with some PC-Simulator problems. Early versions of OS/2 taught the bitter lesson—either you run the 20,000 DOS applications that exist or you don't sell.

From the perspective of a business application programmer like myself, I see OS/2 2.0 and Windows NT competing for three different audiences. In the first group are programmers who write commercial products. In the second group are in-house professional programmers who create software their companies use to run their day-to-day operations. In the third group are the casual programmers who write software to help automate their departments' work load.

Many in the shrink-wrap camp will divide into two or more teams and write versions of their products for both NT and OS/2, with perhaps versions for Unix, NextStep, and the Mac. Small companies without enough programming resources to create multiple versions of their products have two choices: Toss a coin and pick an operating system or use a virtual toolkit that spans multiple platforms. The choice depends partly on the type of application. If you're in this camp and your application won't tolerate the overhead of a virtual toolkit, I can't tell you which operating system you should bet the farm on.

I'd guess that many in-house professional programmers will want to write for OS/2. Why? OS/2 2.0 already offers the features that developers asked for when they complained about DOS (not enough memory, too simple, and 64-KB segments) and Windows (too easy to cause an unrecoverable applications error). The casual programmer will likely continue to use DOS or DOS and Windows to create small-scale, helpful software.

It Will Be Ready When?

Ultimately, OS/2 and Windows NT are very similar. NT has a lot of nice features; OS/2 has nice features of its own. Different programmers will prefer each one for different applications.

If IBM enhances OS/2 to encompass features like threaded PM message queues and multiprocessor support, the competition between Microsoft and IBM may boil down to a simple price war. If this happens, a customer-driven company like Apple will surely be the winner.

Software projects never finish when the marketing people say they will. In fact, software projects hardly ever finish when *programmers* say they will. Windows NT 1.0 is an ambitious effort, and I expect that its birthing pains will be similar to those of OS/2 2.0. As a programmer, I feel safe telling you that if Windows NT is a real for-sale product able to run DOS, Win16, Win32, and other types of applications by the end of the year, I'll eat a disk. However, let me temper that by saying I also expect that I'll probably do some Windows NT programming in 1993 or 1994. ■

Barry Nance is a contributing editor for BYTE. A programmer for 20 years, he is the author of Using OS/2 2 *(Que, 1992) and is the exchange editor for the IBM Exchange on BIX, where you can reach him as "barryn."*

Your questions and comments are welcome. Write to: Editor, BYTE, One Phoenix Mill Lane, Peterborough, NH 03458.

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ASK BYTE



Pass the PCMCIA

I recently purchased a Sharp PC-3000, a new palmtop IBM XT compatible that is fantastic. Its size is slightly larger than a VHS videocassette, and it has a very large screen.

This product is new in Hong Kong. I have managed to find all the cables and options for the machine except what is referred to as the industry-standard IC cards designed to conform to PCMCIA 1.0 (not more than 3.3-mm thickness). Very little is known here about where to get them. Sharp dealers simply tell me these are not yet available from Sharp. Who might have these cards?

Ted Wilson
Hong Kong

One computer that I have seen that uses the PCMCIA card is Hewlett-Packard's HP 95LX palmtop computer. HP sells two RAM cards: 128 KB ($199.95) and 512 KB ($399.95). Computer dealers in Hong Kong should have these cards in stock. I suggest that you take your computer to a dealer and see if they will work. If necessary, you can contact HP at 1000 Northeast Circle Blvd., Corvalis, OR 97330, (503) 757-2000.

The PCMCIA 2.0-specification cards have the same size and physical features, with 68 pins on one end of the memory card. But this newer specification lets you execute programs on the memory cards and use the card port as a generalized I/O device. This means that, theoretically, you can use the cards as system RAM or use the port to connect your computer to hard drives or LANs.—Stan Wszola

The Eyes Have It

I cannot look at a computer screen for more than 15 minutes before my eyes become irritated. I have had an eye examination, and the ophthalmologist tells me that there is nothing special about computer screens that should hurt my eyes.

I spoke with several computer dealers about the problem, and they gave different explanations. Some blame the screen resolution. Others blame refresh rates and recommend a noninterlaced monitor. Both interlaced and noninterlaced monitors hurt my eyes, however.

I've heard of LCD monitors that are thin and flat and that mount anywhere. Would these prevent eyestrain? I'm also interested in knowing about the effect of ultraviolet light, room lighting, and ergonomic factors.

Bryan Chung
Miami, FL

I'm surprised that your ophthalmologist couldn't help you. While computer screens are not inherently evil, they can be hard on your eyes. Your eyes have a natural "resting point of accommodation," where they tend to focus when relaxed. For most people, that falls somewhere between 20 feet and infinity. A typical computer monitor is 20 to 28 inches from your eyes. As you use the computer, your eyes have to constantly work to keep focused at this close distance.

Folks who sit and stare at a screen all day compound the problem by forcing their eye muscles to hold this unnatural position for long periods of time and making constant tiny left-right movements to read lines of text. Periodically, look away from the screen and focus on some distant object.

Color is another factor. Different wavelengths cause the retina to focus differently. Chromatic aberration *makes your eye constantly focus in and out as you look at different colors on the screen. While color is great for some things, it can make working with text needlessly painful. LCDs may not be any better. While they don't have the radiation and flicker problem associated with CRT displays, they are usually smaller and offer less contrast.*

Ask your ophthalmologist about glasses ground for reading at computer-screen distances. Adjust the ambient room lighting to be two to three times brighter than the screen background, and position the monitor so it's slightly below eye level. If you're using a color monitor, make sure it's a high-quality unit, the bigger the better, and try moving it farther away.

Even better, switch to a good-quality monochrome monitor. These don't have problems with convergence or dot-pitch limitations, and they generally have better contrast than color tubes. Above all, take frequent breaks. Rest your eyes, look around the room, or take a walk. Computers and Visual Stress *from Abacus (ISBN 1-55755-128-6) has a chapter on eye exercises that may help. It also offers a good summary of the problems.*

—Howard Eglowstein

Is Your Keyboard Latent?

We received several letters in response to Colin Vernon's letter in the February Ask BYTE. When you press a key on some IBM Enhanced-style keyboards, incorrect characters may appear on your display. The problem is due to a latency problem involving INT 9 hexadecimal. Enhanced-style keyboards often generate a long series of scan codes for a single key press. Unfortunately, some BIOSes in AT-class machines let other interrupts occur before the machine has processed all these scan codes for that key press.

A suite of freeware utilities available from BIX or CompuServe solves the problem. You'll find INT009FIX.ZIP in the IBM.PC listings area on BIX or in CompuServe's PCVEND Forum as INT9FI.ZIP. These files, which were developed by Artisoft, include documentation.

Also, check out KBDFIX.ZIP in the Borland listings area on BIX. The .ZIP file includes executable files and source code (Pascal and assembly language). The freeware programs don't all work with every computer, so you might need to download both .ZIP files to find a program that works. Thanks to Andy Cooper of Downingtown, Pennsylvania, Lou Marles of Peterborough, Ontario, Canada, and Rich Roth of Artisoft for their suggestions.—Stan Wszola

Se Habla ASCII?

I work for a data-entry company in the Dominican Republic and have to translate specialized Spanish text into English. Is there specialized translation software for technical documents?

Rafael Mota Legreaux
Queens, NY

Machine translation has become a hot market. See "The Multilingual Edge" in the March 1991 BYTE for an overview of the technology, explanations of machine translation terminology, and a company list.

Globalink (9302 Lee Hwy., Suite 440, Fairfax, VA 22031, (800) 255-5660, ext. 29, or (703) 273-5600; fax (703) 273-3866) has a translation system for the PC. GTS Basic ($498) includes a 2-MB general dictionary. GTS Professional ($995) lets you add subject-specific dictionaries (i.e., business-finance, legal, and computer terminology) for $100 each. Either version lets you add new words to the primary dictionary.

One of the complaints about machine translation is the literal, word-by-word method the software uses to translate a document. A translating thesaurus like Lexica from WordStar International (201 Alameda del Prado, Novato, CA 94949, (800) 523-3520 or (415) 382-8000; fax (415) 883-1629) can help polish up the final translation. Lexica groups words according to concept, so you can analyze meanings and nuances. The five-language version of Lexica (English, French, German, Spanish, and Dutch) sells for $295.—Stanford Diehl

Speaking by Numbers

I am interested in speech-controlled input for PCs. I'd like to use such a system for bookkeeping. Instead of typing in the numbers manually, I'd like to speak the numbers into a microphone and have them appear in the program. I would appreciate any information about these voice-recognition systems and where to get them.

Peter Darnert
Peia, Argentina

Two inexpensive options are the Voice Master ($149 from Covox, Inc., 675 Conger St., Eugene, OR 97402, (503) 342-1271; fax (503) 342-1283) and the Bug Voice Command System ($799 from Command Corp. (3675 Crestwood Pkwy., Duluth, GA 30136, (404) 925-7950). You might also try Verbex Voice Systems (1090 King Georges Post Rd., Building 107, Edison, NJ 08837, (908) 225-5225; fax (908) 225-7764) and Votan (6920 Koll Center Pkwy., Pleasanton, CA 94566, (800) 877-8746 or (510) 426-5600). Give these companies a call and tell them the specific application you have in mind.

On the higher end of the PC platform, Dragon Systems (320 Nevada St., Newton, MA 02160, (617) 965-5200; fax (617) 527-0372) has an impressive voice-recognition package called DragonDictate ($8995), with a 30,000-word vocabulary. IBM VoiceType is based on the same technology, but it has a smaller vocabulary (7000 words) and a smaller price tag ($3185). Both systems include software and a speech-recognition board.
—Stanford Diehl

Soft on Graphics

I am trying to configure a PC or other system to stamp photographs on clothing. What do I need?

Jorge Rodriguez
Porto Alegre, Brazil

Black Lightning (RR 1, Box 87, Depot Rd., Hartland, VT 05048, (802) 436-3257) remanufactures toner cartridges for Hewlett-Packard LaserJet printers. By adding colored dye to the laser-printer toner, the company has created a sublimation-transfer toner. The toner looks black when you print it onto normal paper, but by heating the paper, you can transfer the image to other surfaces, including fabrics. Black Lightning sells the toner in many colors. Cartridges are $80 each.

For hardware, you need a laser printer that accepts a Canon EP or EP-S cartridge. Then use any graphics software package that can horizontally flip the image you want to print. The LaserWriter print driver does this automatically. Adobe Illustrator and CorelDraw can also do this. It helps if the software can create color separations. You can then print multiple colors by changing the toner cartridge for each color pass.—Stanford Diehl

Writers' Bundle

I would like information on software called Writer's Toolkit for Windows and other such packages.

Michael Briley
South San Francisco, CA

Writer's Toolkit for Windows is an excellent electronic reference set. It includes Houghton Mifflin's CorrecText grammar, style, punctuation, and spelling checker; the American Heritage Electronic Dictionary; Roget's II Electronic Thesaurus; the Concise Columbia Dictionary of Quotations; Houghton Mifflin's Abbreviation Program; the Written Word III: Principles of Grammar and Style; and the Dictionary of Common Knowledge. Systems Compatibility Corp. (401 North Wabash, Suite 600, Chicago, IL 60611, (800) 333-1395 or (312) 329-0700; fax (312) 670-0820) sells the bundle for $129.

Reference Software International (330 Townsend St., Suite 119, San Francisco, CA 94107, (800) 872-9933 or (415) 541-0222; fax (415) 541-0509) sells the Writer's Pack for $149. It includes Grammatik IV 1.0, WordScience's Definitions Plus, The Associated Press Stylebook, and KeyNotes Writer's Handbook.

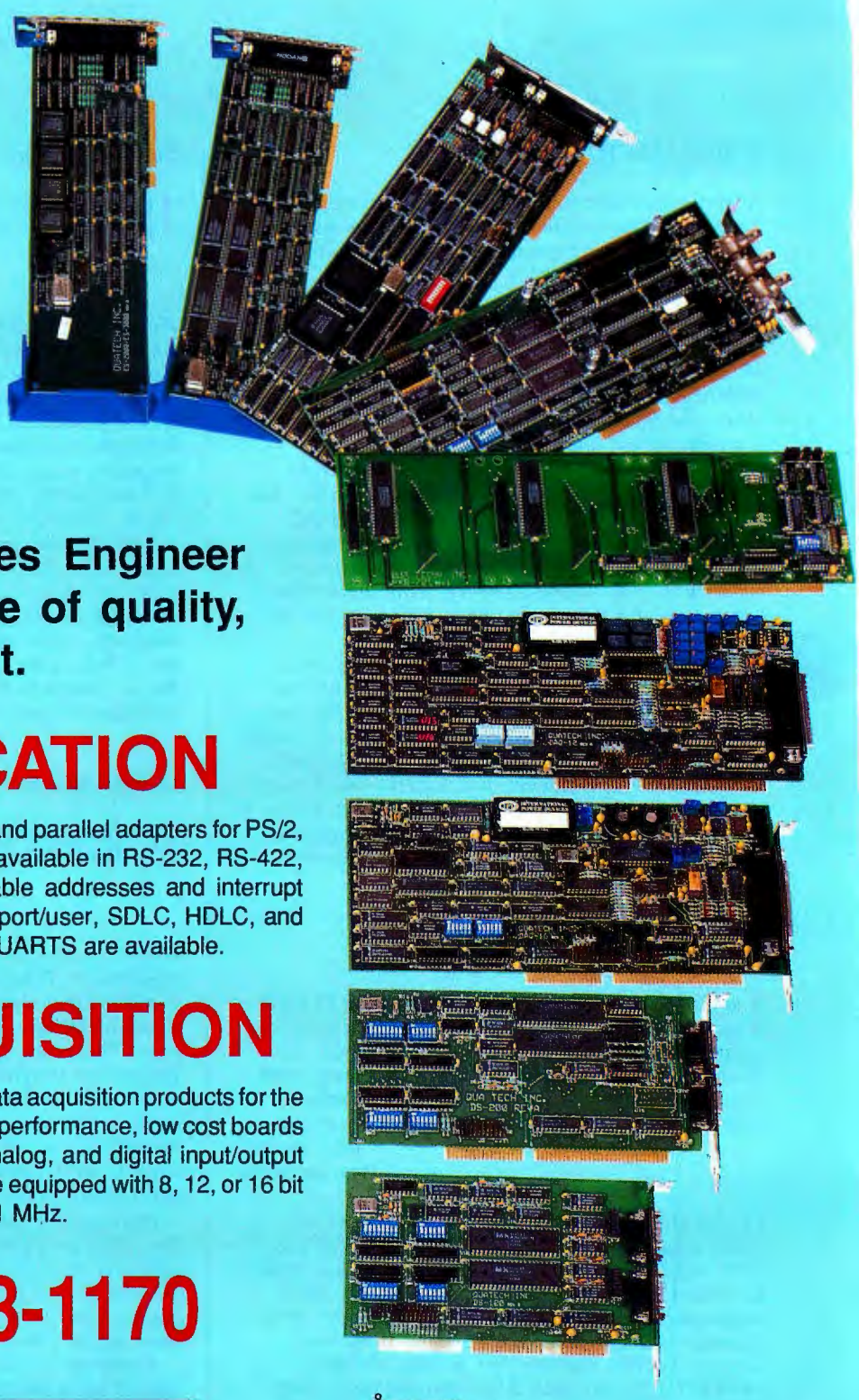
Choose the package that has the reference works you want or buy a specific reference package separately. That way, you can mix and match to fit your needs.

Also, consider the growing body of reference works on CD-ROM. Call the Bureau of Electronic Publishing at (800) 828-4766 for a catalog.—Stanford Diehl ■

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2 x 32 Bit Local Bus Expansion Slots
64K Cache RAM (Expandable to 256K)
4MB RAM (Expandable to 32MB) 60ns
125 MB IDE Hard Drive w/Cache
Teac 1.2MB 5.25" & 1.44MB 3.5" Drives
1 MB SVGA Non-Interlaced Color card
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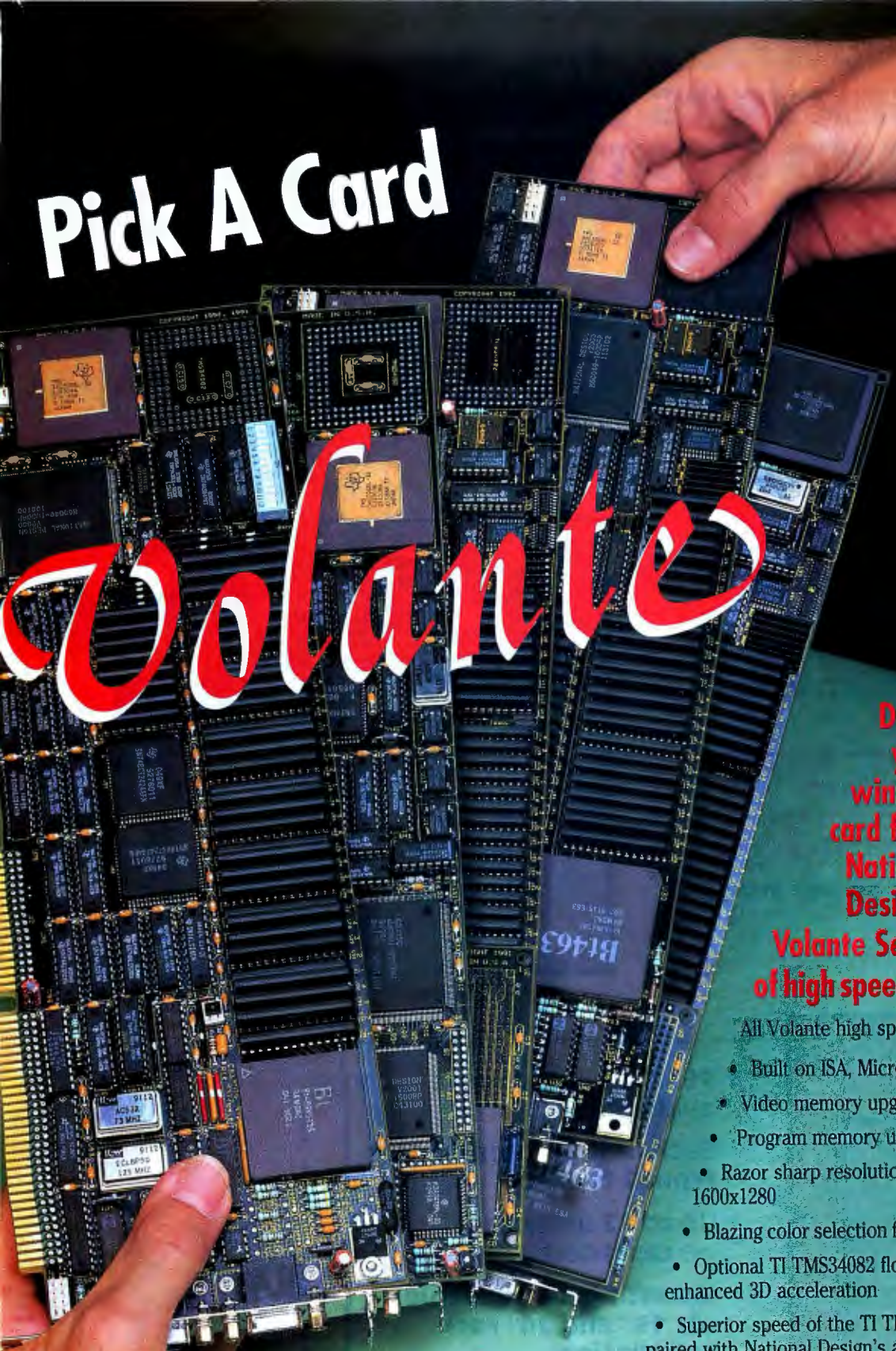
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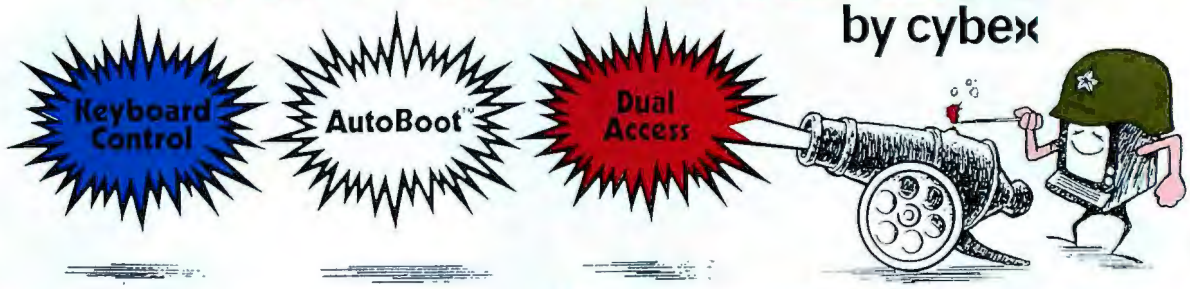
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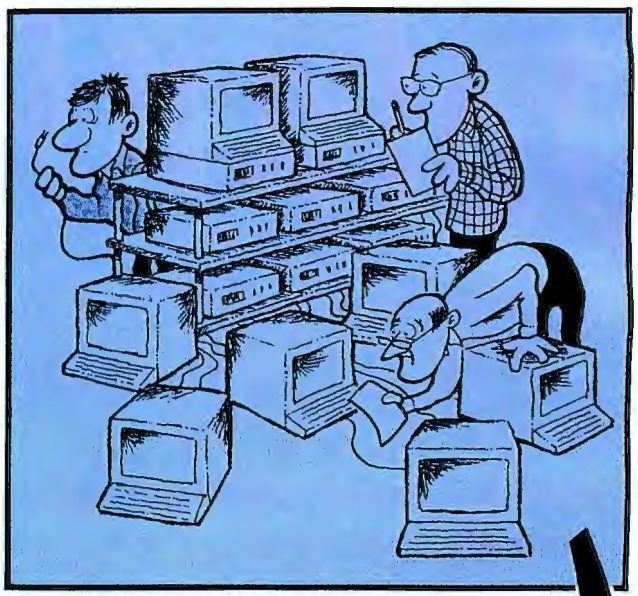
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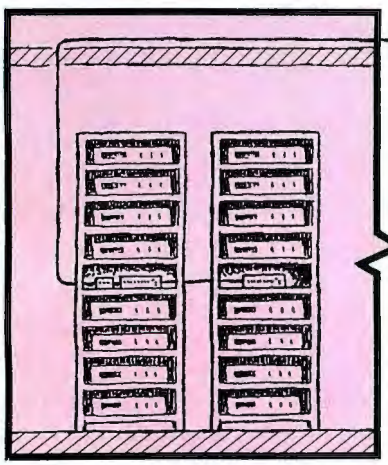
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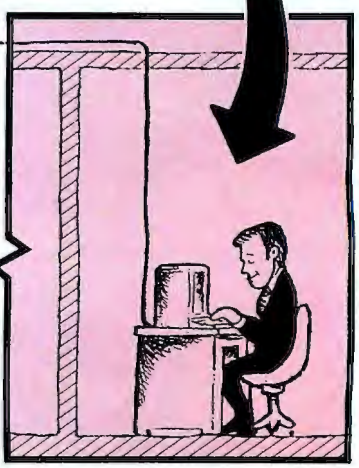


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intel

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T3100e	2MB Kit	119.00
T3200/SXC	2MB Kit	119.00
	4MB Kit	209.00
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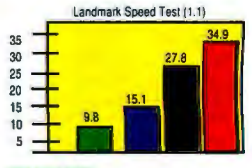
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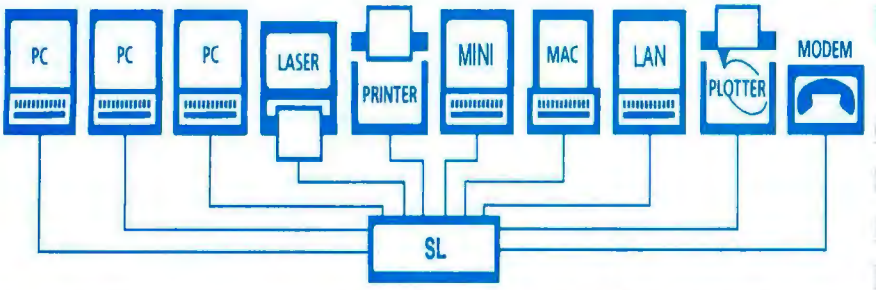
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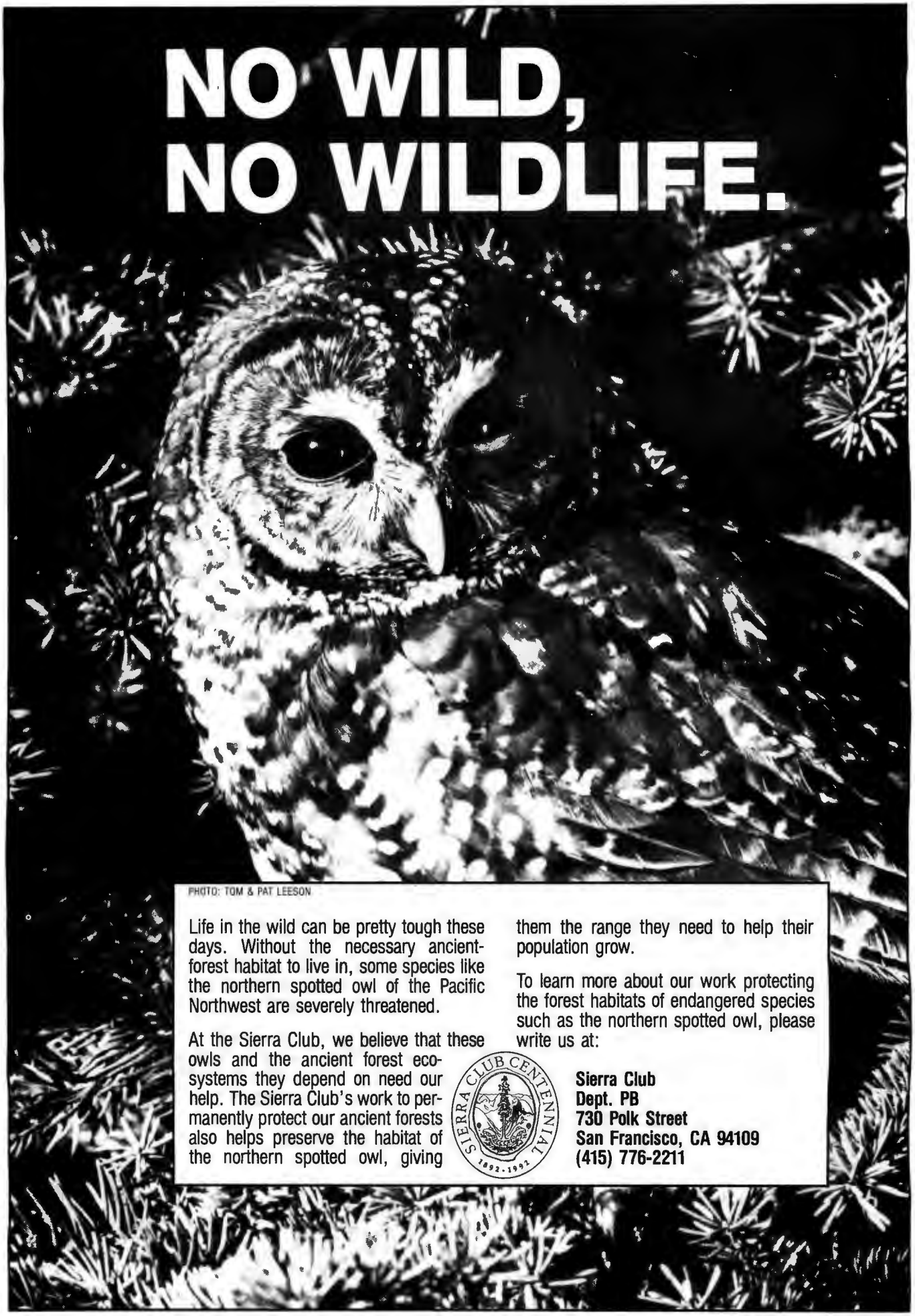


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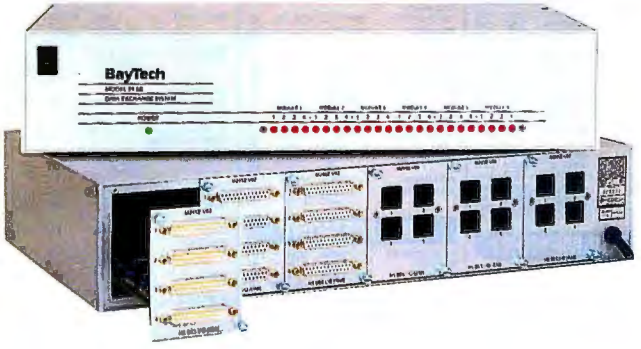
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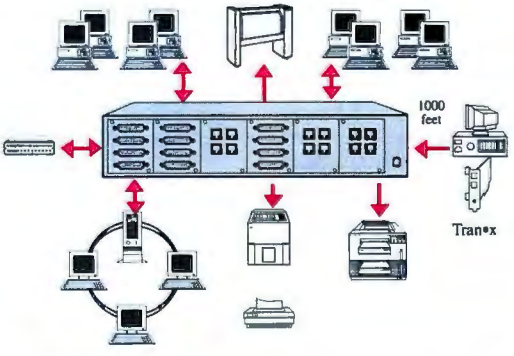
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PS/2 80-A21, A31, A61	4MB MODULE	6451060	255
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DESKPRO 286E	1MB MODULE	113131-001	65
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	2MB SIMM	116689-001	110
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MAC II, IIX, IICX & SE/30	1MB KIT	M0218	60
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	4MB KIT	M0707	180
	16MB KIT	N/A	700
MAC IIFX	4MB KIT	M0378LL/A	185
	16MB KIT	N/A	650
LASER WRITERE II-NTX-J IIF & IIG	1MB KIT	M6005	75
	4MB KIT	M6006	185
	16MB KIT	N/A	650
MAC II VIDEO	KIT	M0213	90
MAXIMA	SOFTWARE	N/A	75

ALR MEMORY

VENTURA NOTEBOOK 16 & 20	1MB MODULE	12407370	$ 225
	4MB MODULE	12407980	1,090
POWERFLEX & 20CSX	1MB KIT	12901800	70
	2MB KIT	12902000	105
	4MB KIT	12904000	210
	16MB KIT	N/A	785
POWER PRO	4MB KIT	12904000	210
	16MB KIT	12916000	750
POWER CACHE 486 & 486E	2MB KIT	12902000	110
	8MB KIT	12904000	395
	32MB KIT	12916000	1,400
BUSINESS/ POWER VEISA	1MB KIT	12901000	70
	4MB KIT	12904000	205
	16MB KIT	12916000	805
1-32MB EXP BD	12427480		261
	4-32MB EXP BD	12447480	532
	8-32MB EXP BD	12467480	732
	16-32MB EXP BD	12487480	1,105

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	32MB KIT	310-2470	1,750
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	4MB KIT	310-2390	230
	8MB KIT	N/A	429
320N & 212N	1MB SIMM	310-3293	165
	2MB SIMM	310-3294	295
320LT & 316LT	2MB KIT	310-2494	105
	4MB KIT	310-2494	219
	8MB KIT	310-2494	429
325P/D & 333P/D	1MB MODULE	310-2505	65
	4MB MODULE	310-2507	229
325,310,220L,9,316 316SX & 210	1MB KIT	310-2104	70
	4MB KIT	310-2273	229

EPSON MEMORY

NB33	1MB MODULE	A808501	$ 130
	4MB MODULE	A808511	365
EQUITY LT286E	1MB MODULE	A808181	116
EQUITY LT386SX	2MB MODULE	A808361	225
EQUITY IIE 386/25,20	1MB KIT	A808001	61
	2MB KIT	A808101	111
386SX,20,25 & 286 4863X/25 +	1MB KIT	A808231	86
	2MB KIT	A808101	116
386SX/20 +	8MB KIT	A808531	600

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TEMPO 386SX	1MB KIT	N/A	60
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286 STEP 12, 16	1MB KIT	N/A	80
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386 STEP 16, 20, 25	1MB KIT	N/A	60
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	8MB SIMM	D2125A	450
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QS/16S & ES/12PC	2MB KIT	D1354A	105
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QS/20PC & RS/25PC	1MB KIT	D1640A	65
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	8MB BD SET	A2201A	840
	16MB BD SET	A2202A	1,575
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GOLDSTAR GS520 386SX/16	1MB MODULE	N/A	135
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SHARP PC-6220 PC-6240	1MB MODULE	CE-6218	122
	2MB KIT	N/A	195
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	2MB MODULE	N/A	290
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	4MB MODULE	N/A	270
TI TRAVELMATE 2000 TRAVELMATE 3000	1MB MODULE	2568034-0001	110
	2MB KIT	2568996-0001	145

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	8MB BD	N/A	772
POWERMATE 386/16 & 20	4-16MB BD	N/A	766
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	8MB BD	N/A	1,222
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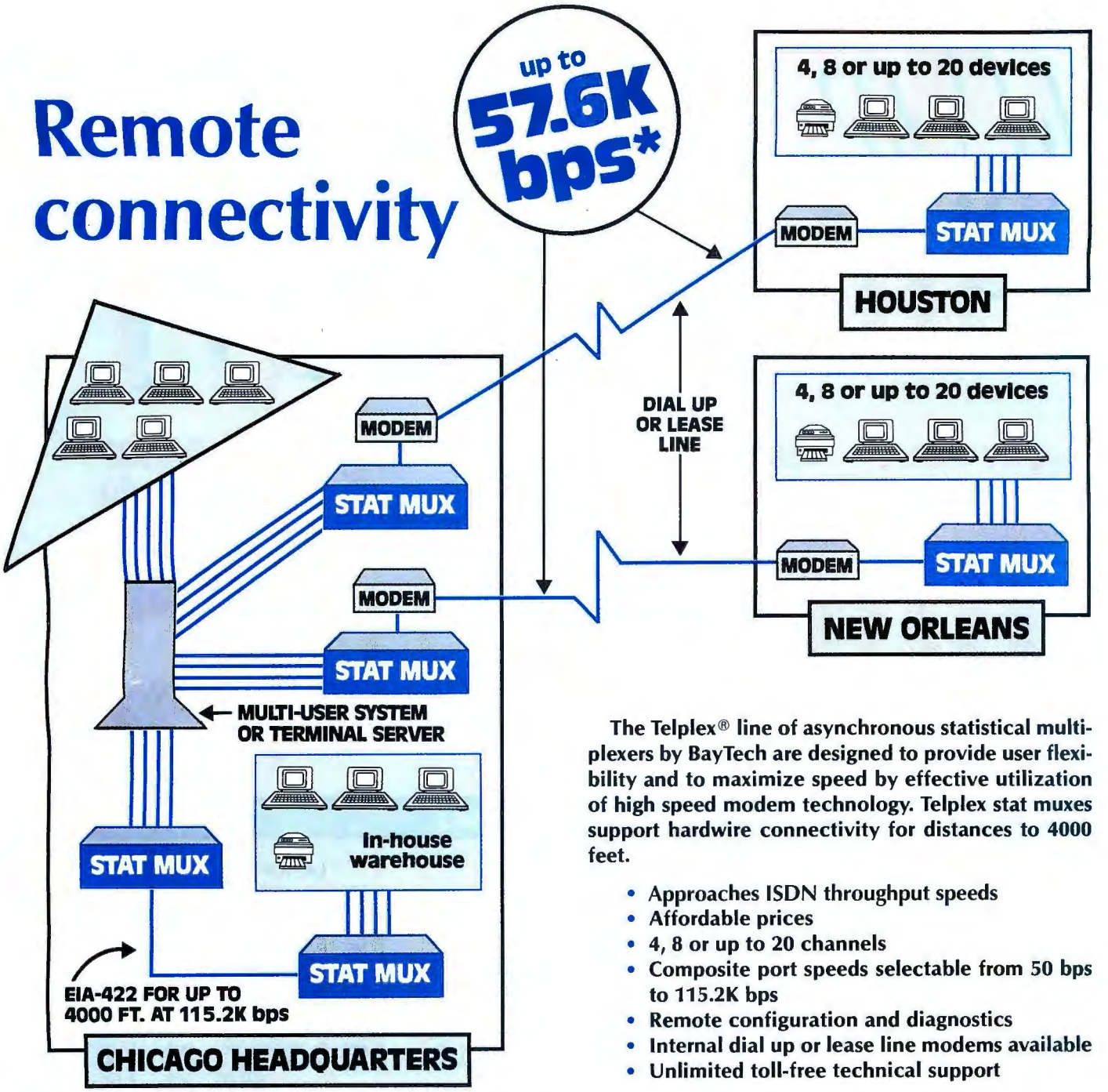
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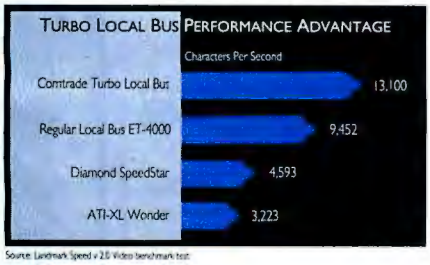
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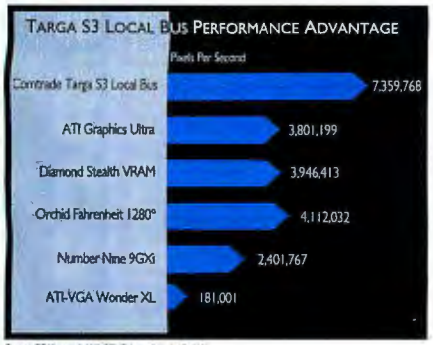


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Source: Landmark Speed v 2.0 Video benchmark test



Source: PC Magazine's WINBENCH test (March 17,1992)

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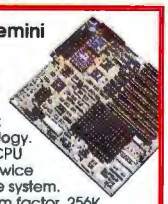
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CONNER 2064 2.5" 60MB IDE HARD DRIVE	$328
CONNER 2084 2.5" 80MB IDE HARD DRIVE	$398
CONNER 3204 3.5" 212MB IDE HARD DRIVE	$748
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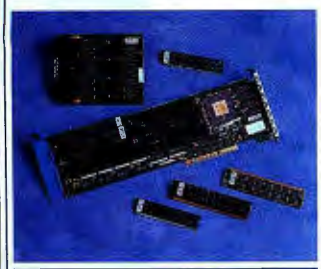
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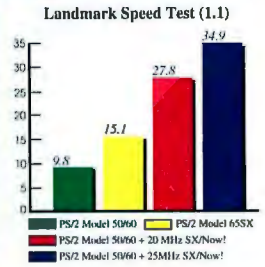
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2MB Kit	30F5360	$99
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2MB	6450604	$95
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2MB	6450608	$95
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PS/2 35SX; LS, 40SX		
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2-8MB w/6M	1497259	$479
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	4MB	$289
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LTE Lite/20, 25 NEW!	4MB	$489
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	8MB	$549
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T3100SX, T3200SX, SXC	2MB	$105
	4MB	$169
T3200	3MB	$179
T4400, T6400 NEW!	2MB	$229
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	8MB	$789
T5100	2MB	$115
T5200, T5200C, T8500	2MB	$115
	8MB	$369
ZENITH		
MastersPort 386SL	2MB	$159
MastersPort 386SX	2MB	$169
S.S. SX, 286E, SlimsPort	2MB	$149
SupersPort SX	2MB	$149
SupersPort 286, 286E	1MB kit	$109
SupersPort 286E, SlimsPort	4MB	$439
TurbosPort 386, 386E	1MB	$159

NEC MEMORY

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1-2MB Brd	APC-H850E	$179
4-8MB Brd	APC-852E	$559
Powermate SX/20		
2MB CPU	OP-410-8101	$189
2MB Brd	OP-410-8102	$209
Powermate 386/20, 25		
8MB	APC-H655	$899
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Hewlett-Packard LoserJet II and IID		
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4MB	33445B	$195
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256K	22707B	$59
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3.5MB	1038675	$189
IBM Laser 4029 All Models		
2MB	1183334	$159
4MB	1183335	$219
Canon LBP-4		
2MB	PN N/A	$229
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4MB	LS6-N80100	$199
OkiLaser 400		
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Epson EPL 6000		
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Epson Action Laser II		
NEW! 2MB	PN N/A	$279

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DeskPro 386-20, 20E and 25		
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DeskPro 386S/16		
4MB	112534-001	$179
DeskPro 286N, 386N		
0K Board	118700-001	$89
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Premium 386, 386-20		
4MB Kit	5005I0-004	$239
Bravo 386-SX, WS/286, 386		
2MB Kit	5005I0-002	$99
4MB Kit	5005I0-008	$189
Premium 386/25;33,Premium II 386SX/16;20		
1MB w/WPB	500780-003	$69
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1MB	ZA-36/3800-ME	$59
4MB	ZA-3800-MK	$179
Zenith Z-386SX, 286PL+, Z-LS		
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Zenith 486/25E		
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- AMI BIOS, Symphony™ Chipset, Dallas DS1287 real-time clock (w/10-year warranty) • 256k Cache SRAM exp. to 1MB
- 8MB RAM 60ns expandable to 32MB onboard
- 1.2MB & 1.44MB Floppy Disk Drives (TEAC)
- 210MB, 15ms, 64k Cache IDE HDD • IDE HD/FD Controller
- Diamond Stealth1280 Card, 1MB VRAM,16-bit VGA card, Hi Sierra color (up to 25 times faster than standard VGA)
- 14" Super Multiscan,1024x768,non-int.,0.28dp,(Relisys-1422)
- 1 Parallel / 2 Serial Ports • Keytronics 101 Keyboard (USA)
- Mid Tower case (Heavy duty), 230W UL P/S & digital display
- MS-DOS 5.0 • MS-Windows 3.1 and MS compatible mouse
- **OPTION: Sony CPD 1304S/1604 monitor - add $265/675**
- **OPTION: Nanao 9080I /T560I monitor - add $735/1595**
- **OPTION: Full Tower - 10-bays, 275W P/S - add $75**

MICRO-L™ ISA 486-33 CACHE (Symphony) $2,035

- Intel 80486-33MHz Processor - Upgradable to 50MHz; Socket for removable crystal allows for CPU changes
- AMI BIOS, Symphony™ Chipset, Dallas DS1287 real-time clock(10yr warranty) • 4MB RAM 70ns exp. to 32MB onboard
- 256k Cache SRAM expandable to 1MB • 1.2MB and 1.44MB Floppy Disk Drives (TEAC)
- 130MB, 15ms, 64k Cache IDE HDD • IDE HD/FD Controller
- SpeedStarPlus, 1MB,16-bit VGA card, Hi Sierra color
- 14" Super Multiscan,1024x768,non-int.,0.28dp,(Relisys-1422)
- 1 Parallel / 2 Serial ports • Keytronics 101 Keyboard (USA)
- Mid Tower case (Heavy duty), 230W UL P/S & digital display
- MS-DOS 5.0 • MS-Windows 3.1 and MS compatible mouse
- **OPTION: 210MB IDE HDD - add $235**
- **OPTION: Sony CPD-1304 monitor add - $265**

MICRO-L™ 386-33 CACHE (Symphony) $1,595

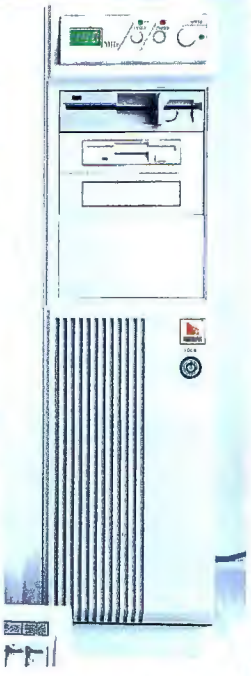
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- AMI BIOS, Symphony™ Chipset, Dallas DS1287 real-time clock (w/10 year warranty)
- 64k Cache SRAM exp. to 1MB onboard (Option: 256k Cache - add $65) • 4MB RAM 70ns exp. to 32MB onboard
- 130MB, 15ms IDE Hard Disk Drive • HDD/FDD controller
- 1.2 & 1.44MB FDDs(TEAC) • 1Parallel / 2Serial / Game ports
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- MS-Windows 3.1 and MS compatible mouse
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- 80MB, 17ms IDE Hard Disk Drive • HDD/FDD controller
- 1.2 & 1.44MB FDDs(TEAC) • 1Parallel/ 2Serial / 1Game ports
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- Deluxe Baby Case with 200W UL power supply ,6-bays
- Keytronics 101 Keybd (USA) • MS-DOS 5.0
- MS-Windows 3.1 and MS compatible mouse
- **OPTION: 386-33 SVGA system - add $35**
- **OPTION: 386-40 SVGA system - add $65**
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- 2MB RAM expandable to 8MB onboard
- 1.2 & 1.44MB FDDs(TEAC) • 1Parallel/ 2Serial / 1Game ports
- 40MB IDE Hard Disk Drive • HDD/FDD controller
- 16-bit VGA card with 512K onboard (Flicker Free)
- 14" SVGA Monitor, 1024 x 768, 0.28dp (Relisys RE-1420)
- Keytronics 101 Keyboard (USA) • MS-DOS 5.0
- MS Window 3.1 and MS compatible mouse
- Deluxe Baby Case with 200W UL power supply ,6-bays
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- 2 serial/1 parallel/1 game ports
- 101Keytronics keyboard
- Desktop case w 200W UL / PS

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MOTHERBOARDS

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- Symphony Chipset - CPU socket accepts 486-33/50 & 486SX-20
- AMI BIOS & Weitek 4167 math-coprocessor
- Up to 32MB SIMM RAM on-board
- Removable crystal allows for CPU changes
- UP to 1MB direct map cache
- Dallas DS1287 real-time clock (10yr warranty)
- Seven 16-bit and One 8-bit expansiosn slots
- Baby size board: 8.5in. x 13in.)

486-50 ISA 256K cache, Symphony	$895
486-33 AT 256K cache, Symphony	$645
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386-33/40 64K cache, Symphony	$315/345
386-25/33 Symphony	$245/265
386-SX25 64k cache	$245
386-SX20 /16	$179/159
286-16	$85

MONITORS

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IDEK VGA 5217(17")/5221(21")	$985/2395
Nanao 16" VGA 1024x768 9080i	$1065
Nanao 20" VGA 1024x768 T560i	$1865
Nanao 20" VGA 1280x1024 9400i	$2065
NEC 3FGX/4FG/5FG	$695/805/1435
Relisys S Multiscan,1024x768 RE-1420	$295
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Diamond Stealth 1280, 1MB VRAM	$290
Orchid ProD IIs 1MB., w/Hi Sierra	$178
Orchid Fahrenheit 1280, 1MB	$280
SpeedStar+ VGA 1MB, w/Hi Sierra	$178
Vermont Dynamaster VGA 1MB	$345

HARD DRIVES

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Maxtor LXT-213A 213MB IDE	$595
Maxtor LXT-340A 340MB IDE	$885
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Maxtor XT-8760SH 768MB	$1345
Maxtor 1.02 GB/1.47GB SCSI	$1895/2295
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Quantum ProDr240A/S 210MB,14ms	$615
Adaptec 1542B - Kit SCSI Cntrlr FD/HD	$260

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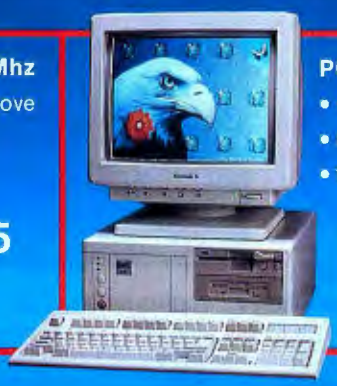
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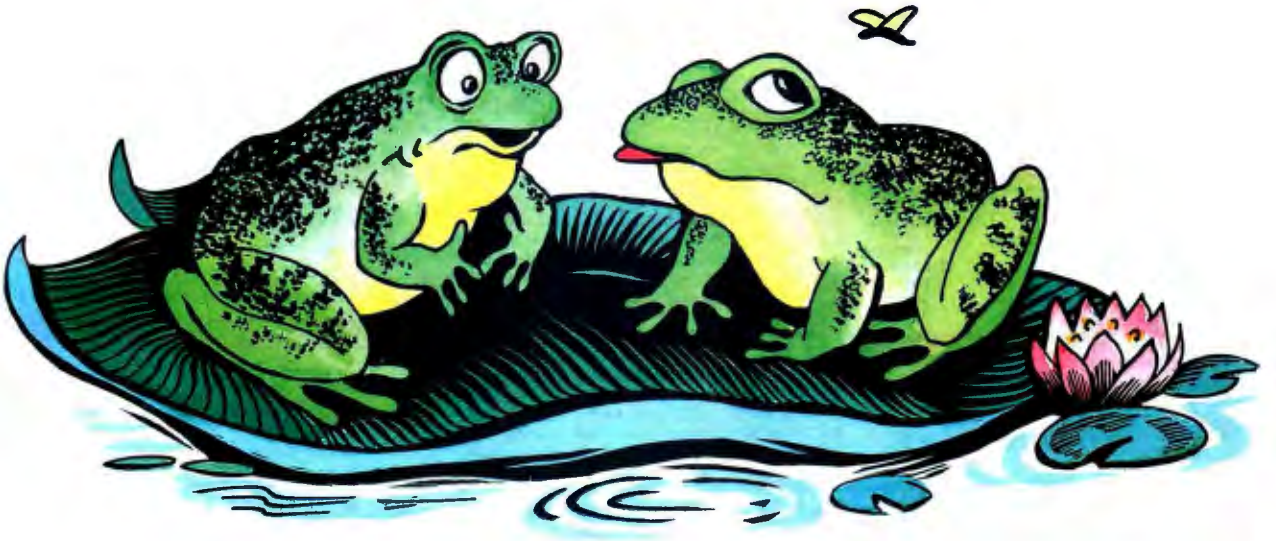
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DESKPRO	1MB MODULE	118688-001	59.00
286N, 386N, 386SX/20	2MB MODULE	118689-001	109.00
	OK BOARD	118700-001	98.00
	4MB MODULE	118690-001	199.00
DESKPRO 386/16	1MB-2MB BOARD	108069-001	299.00
	2MB BOARD	108069W71	348.00
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	4MB-8MB BOARD	108070-001	545.00
	4MB KIT	108072-001	259.00
DESKPRO 386S	1MB BOARD	113633-001	129.00
	4MB BOARD	113634-001	269.00
	1MB MODULE	113646-001	79.00
	4MB MODULE	112534-001	209.00
DESKPRO 386/20, 25, 286E	1MB BOARD	113131-001	59.00
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DESKPRO 386/20E/25E	1MB BOARD	113644-001	129.00
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T1000SE & XE/LE	2MEG	PC14-PA8312U	169.00
T2000SX	1MEG	PC18-PA8316U	114.00
T2000SX	2MEG	PC18-PA8317U	179.00
T2000SX/T1000LE	4MEG	PC-PA8314U	309.00
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T3100E	2MEG	PC9-PA8340 1U	109.00
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T3100SX	4MEG	PC15-PA8310U	195.00
T3200	3MEG	PC6-PA7137U	195.00
T3200SX	2MEG	PC12-PA8307U	109.00
T3200SX	4MEG	PC12-PA8309U	195.00
T3200SXC	2MEG	PC19-PA8318U	109.00
T3200SXC	4MEG	PC19-PA8319U	209.00
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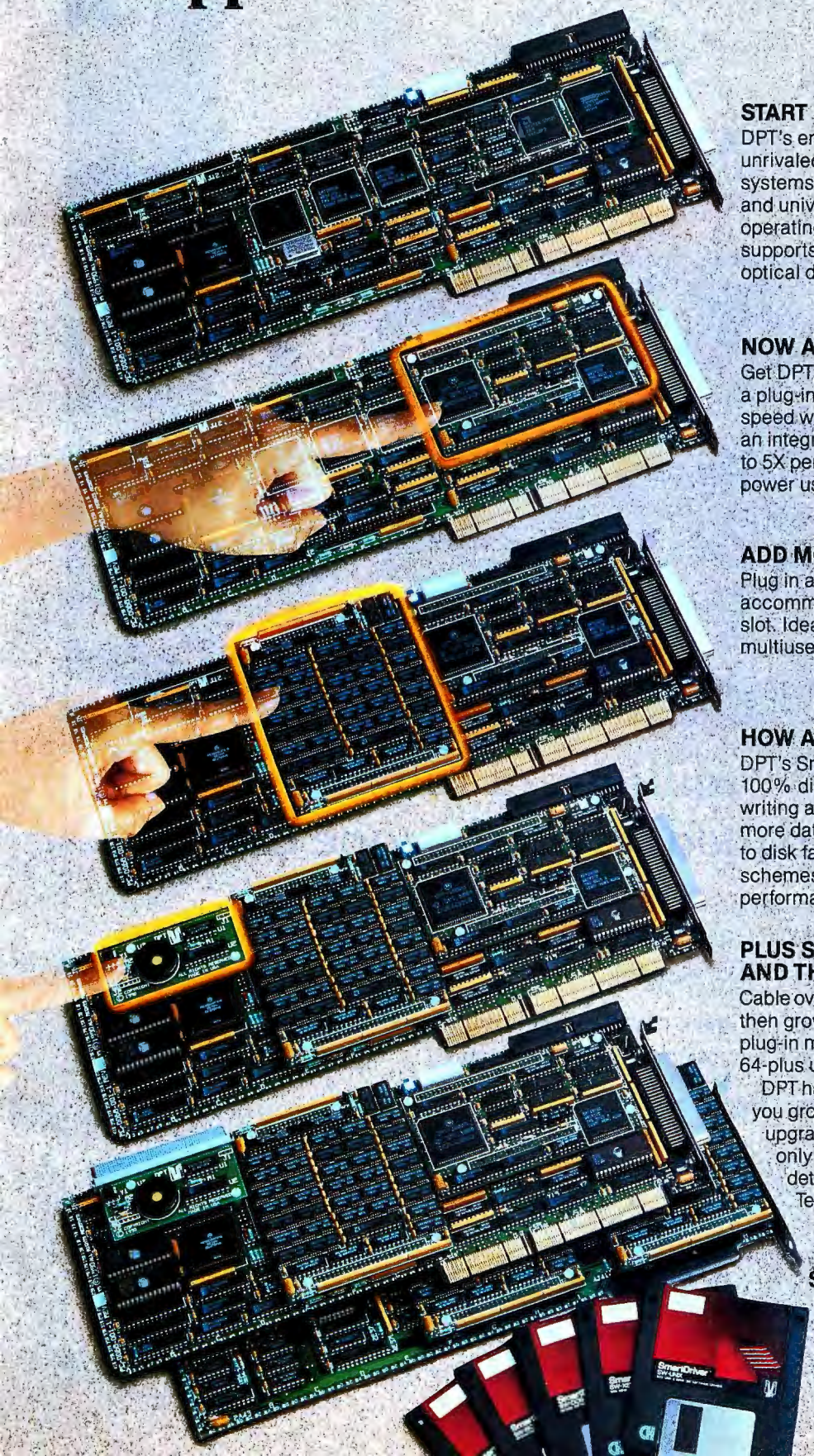
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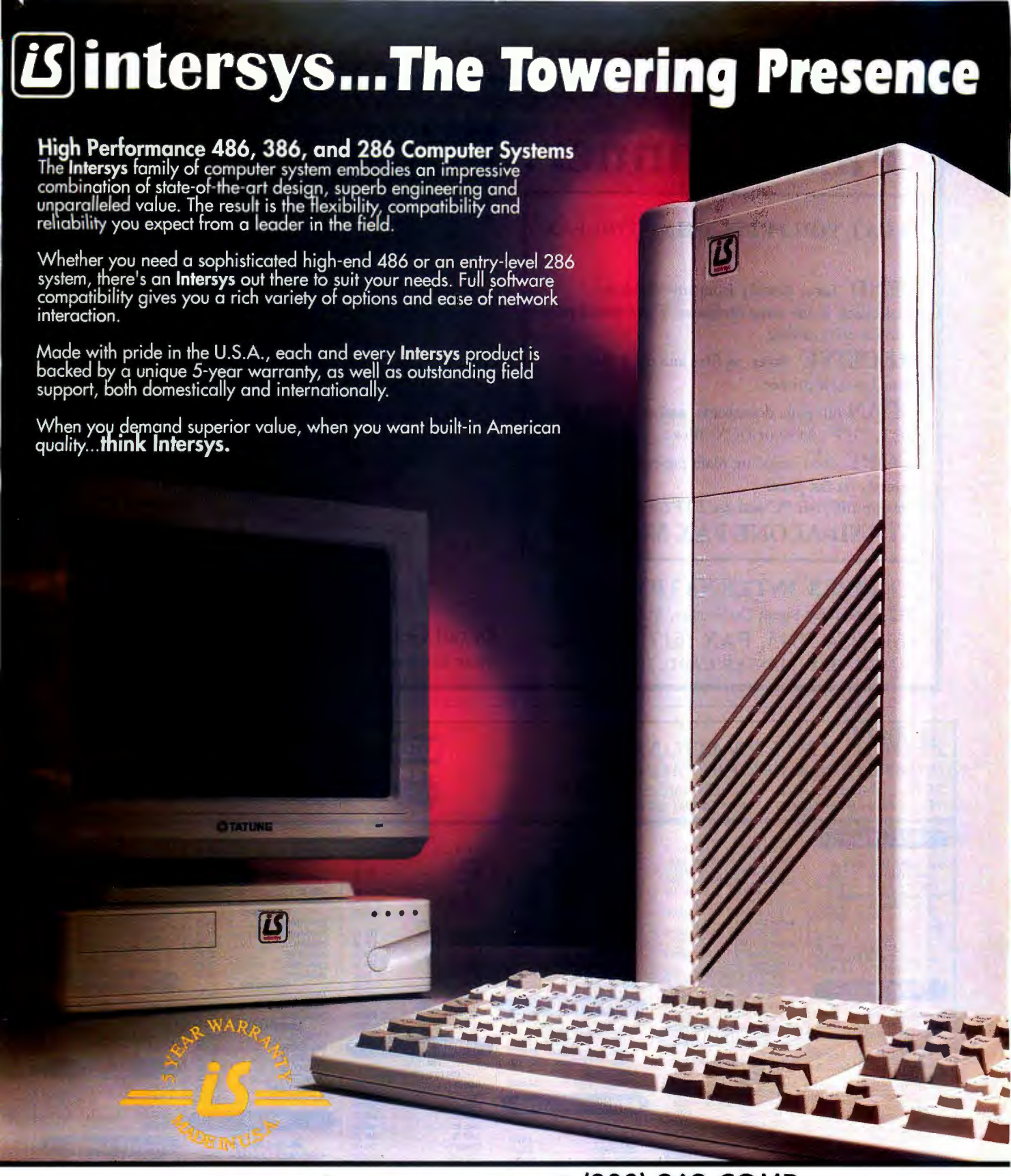
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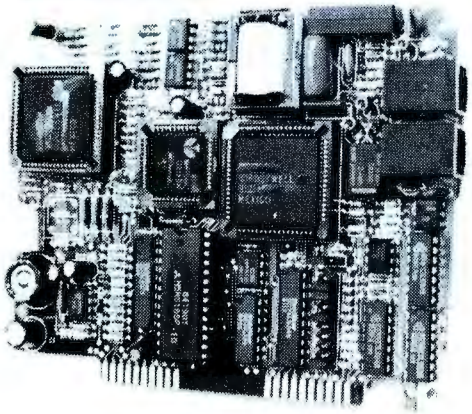
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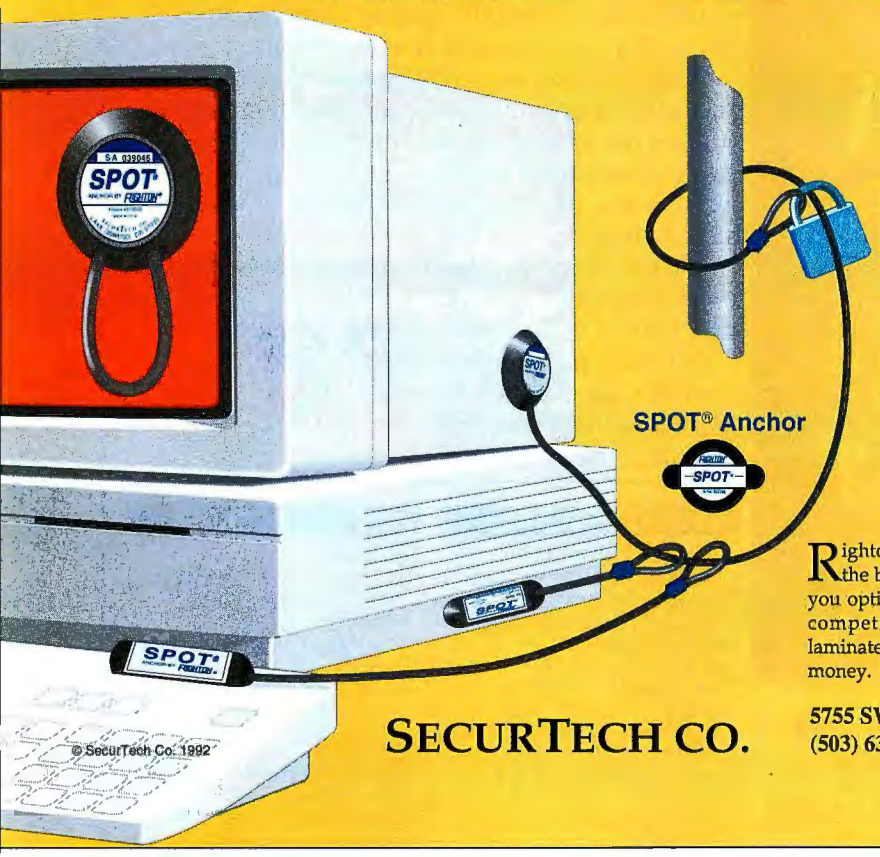
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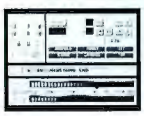
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AVLink Software Program is an integrated interface for Jovan's Multi-media Series products. AVL supports the VINPLUS VGA encoder, the SuperVIA high resolution video digitizer and the SONIA sound card. It provides many useful services from within several software applications, including Autodesk Animator and Autodesk 3D Studio. AVL will "pop" into service by either a hot key sequence or by using the mouse within applications. No need to exit from these applications to access the SuperVIA video capture, the SONIA sound digitizer or VINPLUS VGA to signal converter.



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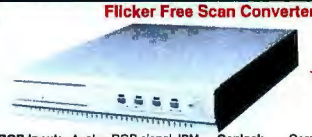
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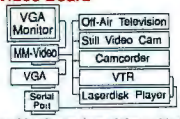
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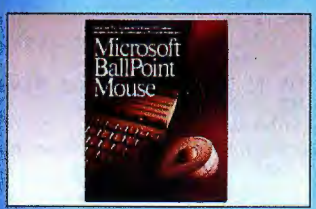






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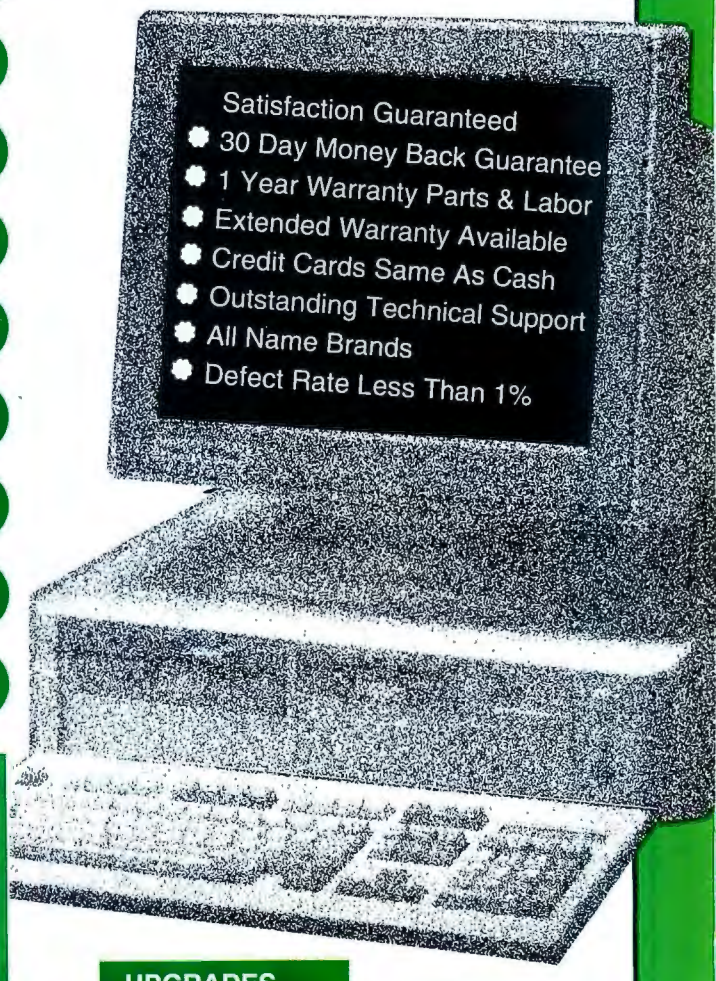
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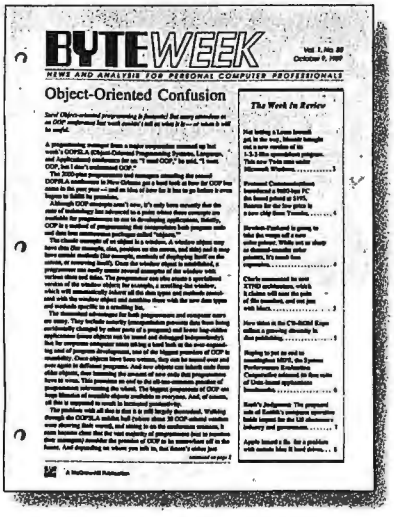
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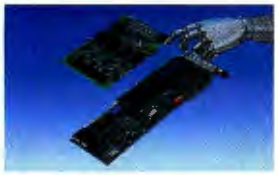
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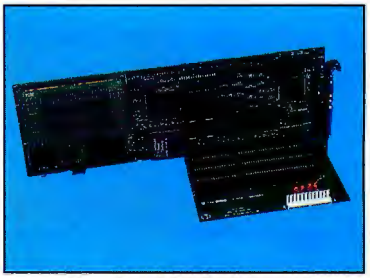
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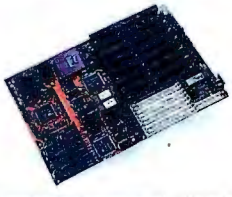
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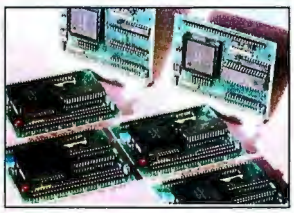
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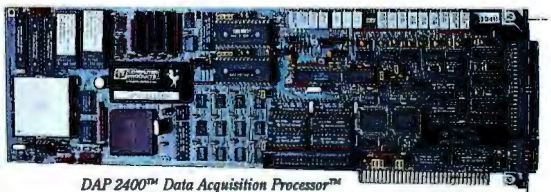


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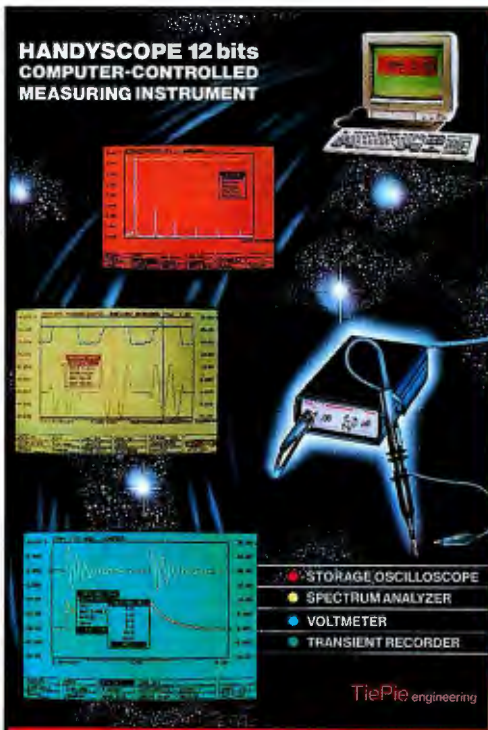
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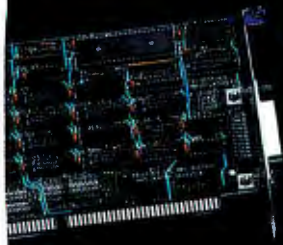
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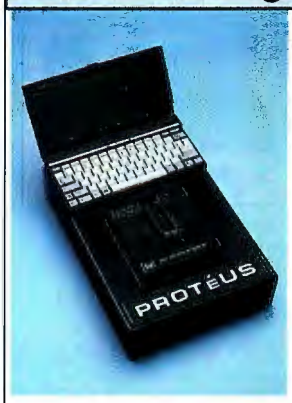
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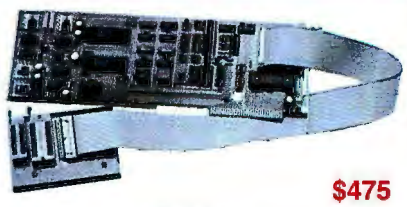
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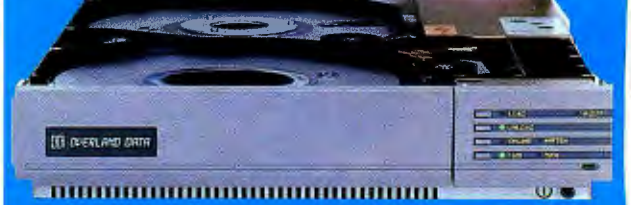
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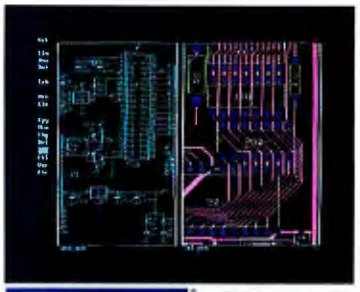
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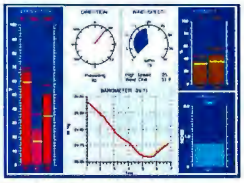
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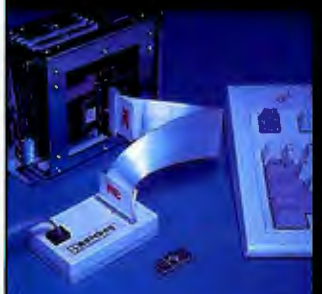
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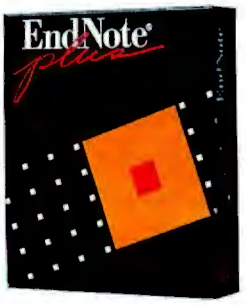
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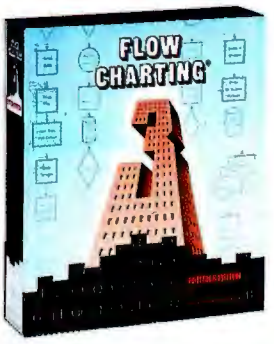
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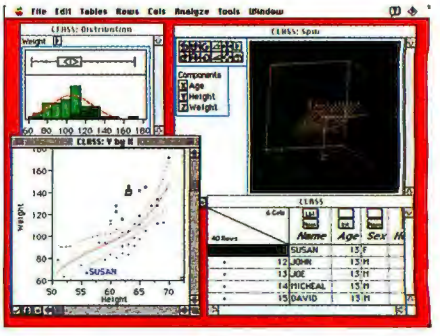
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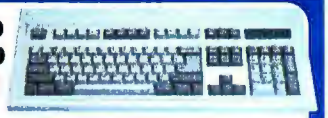
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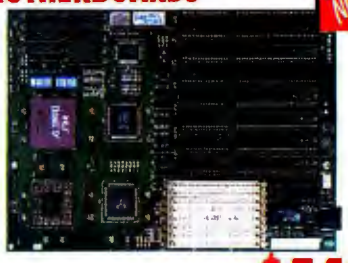


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4 ☐ Sales/Marketing
5 ☐ Engineer/Scientist
6 ☐ Other

B. What is your level of management responsibility?

7 ☐ Senior-level
8 ☐ Middle-level
9 ☐ Professional

C. Are you a reseller (VAR, VAD, Dealer, Consultant)?

10 ☐ Yes
11 ☐ No

D. What operating systems are you currently using? (Check all that apply.)

12 ☐ PC/MS-DOS
13 ☐ DOS + Windows
14 ☐ OS/2
15 ☐ UNIX
16 ☐ MacOS
17 ☐ VAX/VMS

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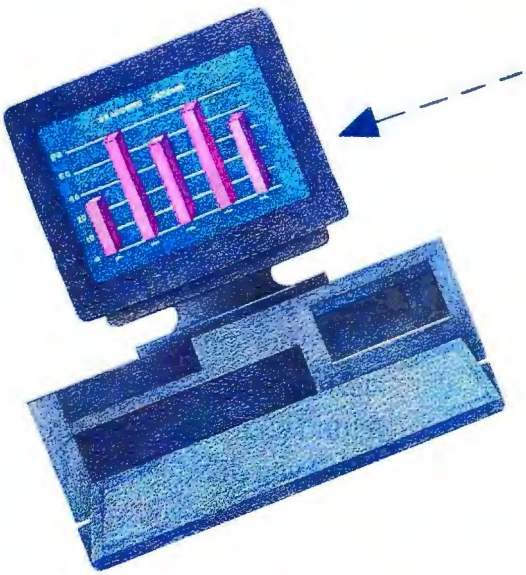
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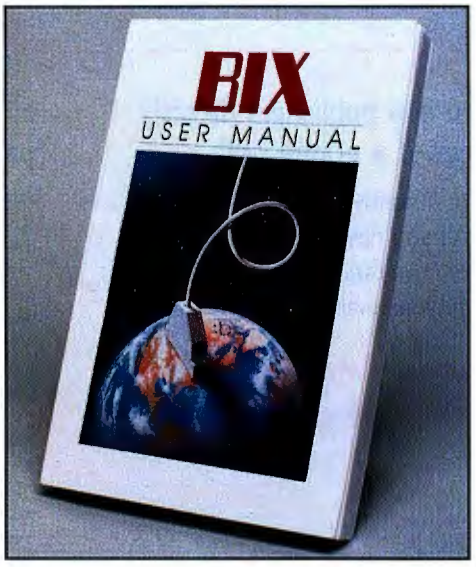
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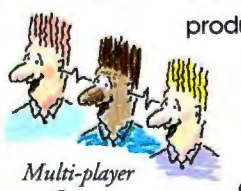


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STOP BIT

WILLIAM F. BUCKLEY JR.

REFLECTIONS ON THE "PRIVACY" QUESTION

Who benefits when your medical records go on-line?

You have gonorrhea.

No, that's untactful.

I have gonorrhea. As of Monday, who knew this? The lab technician to whom Dr. Klein sent my blood for testing, and he knows only that "BS 3/1/92/13—Klein #493399" (blood sample tested on March 1, 1992, number 13 of the blood samples directed to the laboratory by Dr. Klein, whose license to practice medicine in New York is number 493399) came up positive on a gonorrhea test. Now your doctor knows, his nurse knows, and you know. Should anyone else know?

That question reaches into the library of questions confronted by the recently established United States Privacy Council.

Let us suppose that the doctor asks you—as the Consumer Interest Research Institute demands he do, before giving anyone access to the information he collects from his patients—whether you will permit him to furnish your medical data to the Physician Computer Network.

"Will anyone have my name?"

"No. You will be merely a numbered patient."

"OK. But will Mr. Hired Sleuth be able to find out from the Physician Computer Network that Dr. Klein has four patients with AIDS, eight with venereal disease, and one with Kreutzfeld syndrome?"

Dr. Klein had never been asked that question. He pauses. "The Physician Computer Network is interested not in 'my' patients, but in every doctor's patient-histories; interested in the number of patients with this disease or the other (is the number growing? diminishing?)."

Dr. Klein asked me to come over and have a look at what comes out at the other end of the medical-research computer. "Yesterday," (he draws up the information on the screen) "we had this perplexing patient." I note that the name of the patient is given in code. Dr. Klein points to the four symptoms.

"I did not see a pattern in those four symptoms, which included a rash under the right ear. I sent the data into the Physician Computer Network, and in about 1 minute, I was told that these symptoms in the past have indicated a very rare disease called Lombardicunctis, one treatment for which is 200 grams of Glasisturine injected into muscle tissue behind the neck. I did this. The boy's fever this morning is gone, also the rash."

"What about my gonorrhea? If I get appointed to the Supreme Court, is there any way the government investigators could find out? They would discover, easily enough, that you are my doctor. If they came to you, you would say that my medical records are private."

Yes, and the investigators could go to the pharmacy and try to find out what pharmaceuticals regularly go to my New York apartment. But assuming that they succeeded in bribing the pharmacist, they still are pretty well up against it, since there is no drug labeled, "For exclusive use against the clap."

The privacy nuts, in my judgment, will have a hard time. I say this though I believe passionately in privacy and would willingly serve as the jailkeeper at any penitentiary that collected violators of those privacy laws that do make sense. But which are they?

Last December, Congress passed the Telephone Consumer Protection Act, the purpose of which is to enable you to block salespeople from access to your telephone. Fair enough. There is a law that forbids rental agencies from giving out the record of your patronage of their videotapes. It is a very old law, and a good one, that protects your income tax returns from scrutiny by the tabloids or, for that matter, by the *New York Times*.

When my brother served in the Senate, he introduced a law that gave to students the right to examine the dockets, containing faculty evaluations of their work, that follow them about—sometimes for the rest of their lives. Jim's law is understandable—one faculty grouch or spurned lover should not be allowed indelibly to stain your academic record without challenge. On the other hand, it proves more difficult to get faculty to express themselves freely if they know that the subject will see what they write.

It is, in short, a vexed question. The presumption should always be in favor of privacy, but presumptions are rebuttable, and the data in most of the cases here examined suggest that they have been rebutted. My gonorrhea record—taking into account my allergies, the derivative treatment of it, its effect on me—is data with a useful life for others, and it is thoughtless and selfish to deprive the Physician Computer Network of such use as my little iniquity might provide others, bent on sinning 70 × 7 times.

So that, then, is the rule: In favor of privacy arrangements presumptively. But then listen, listen to the other side. It is often compelling. ■

William F. Buckley Jr.'s forthcoming book is called WindFall: The End of the Affair. *You can reach him on BIX c/o "editors."*

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